UNITED STATES ARMY

AVIATION DIGEST

JULY 1967

UNITED STATES ARMY AVIATION DIGEST

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The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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Articles, photos, and items of interest on Army Aviation are invited. *Direct communication is authorized to: Editor-in-Chief, U.S. Army Aviation Digest, Fort Rucker, Alabama.*

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ANNUAL WRITING AWARDS

Major James W. Jay — $250

Major Harold L. Jones — $150

CW3 Valentine Hampton — $100

MONTHLY WINNERS 66-67

SOLO MISSIONS
CPT Patrick H. Brady

AVIATION CAREER COURSE?
MAJ Ernest E. Varney, CPT Arlie Deaton, and LT James W. Martin

GREAT SAFETY MACHINE
LTC Theodore S. Ferry

THE PROFESSIONAL NCO
SGM Glenn E. Owens

PETER PILOT PICKED A PEAKED PLATEAU
MAJ Jack O. Phillabaum (Ret)

THAT OUT-OF-PLACE, FOLLOWED-BY-MOVEMENT LOOK
CPT Thomas O. Kuypers

INFLIGHT TAIL ROTOR FAILURE IN THE IROQUOIS
MAJ James W. Jay

BETTER AIRCRAFT AVAILABILITY —EVERYBODY'S GOAL
MAJ Harold L. Jones

SOMEONE HAD TRIED TO KILL ME
MAJ Charles W. Watkins

DEBUT OF SUPER LOU
CPT Gregg S. Bond

MY FRIEND FUTURE AND HIS CHARIOT
CW3 Valentine Hampton

WITH THIS issue, the U. S. ARMY AVIATION DIGEST begins its seventh annual writing contest. The author of the article selected as the best each month will receive an engraved bronze plaque and a $25 cash award. From these monthly winners, the top three articles of the year will be chosen. First place award will be $250; second place will receive $150; and third place winner will receive $100.

If you have not submitted an article to the DIGEST, now is your chance to win a substantial cash award for your efforts. To be eligible for the contest, an article must be an original manuscript on some aspect of the magazine's mission (see inside front cover). It must not have been previously released to the public. Articles which have already been submitted but not yet published are automatically eligible for the new contest.

By all means send any available pictures, diagrams, charts or other illustrative material with your manuscript. If these are unavailable, the editor would like to receive any ideas you might have for illustrations. Such material will not influence judging of your article for the contest.

Articles chosen for publication will be typed in the author's original form and submitted unedited and without bylines to contest judges. These general criteria will be used in selecting winning articles: accuracy, completeness, originality, readability, reader appeal, soundness, substance, and overall merit.

Manuscripts or queries concerning articles should be mailed to: Editor-in-Chief, U. S. ARMY AVIATION DIGEST, Fort Rucker, Ala. 36360.

$250 — $150 — $100 — $25

25th ANNIVERSARY CONTRIBUTION

Natick Laboratories Support Army Aviation

Brigadier General William M. Mantz
Director, Natick Laboratories

ALTHOUGH IT IS best known for research and development of clothing and rations for the combat soldier, Natick Laboratories play an equally significant role in support of Army aviation.

In providing solutions to the unique problems posed by Vietnam operations, the Massachusetts lakeside military scientific center has been more than usually responsive.

Intensive combat use of helicopters has created a need for the expedited development and procurement of new items for Vietnam. Many are already there in common use. Some, still experimental, are slated for early evaluation under rigorous field conditions.

A typical example of Natick's quick reaction to an urgent military requirement is illustrated by the development of a new lightweight individual survival kit assembly.

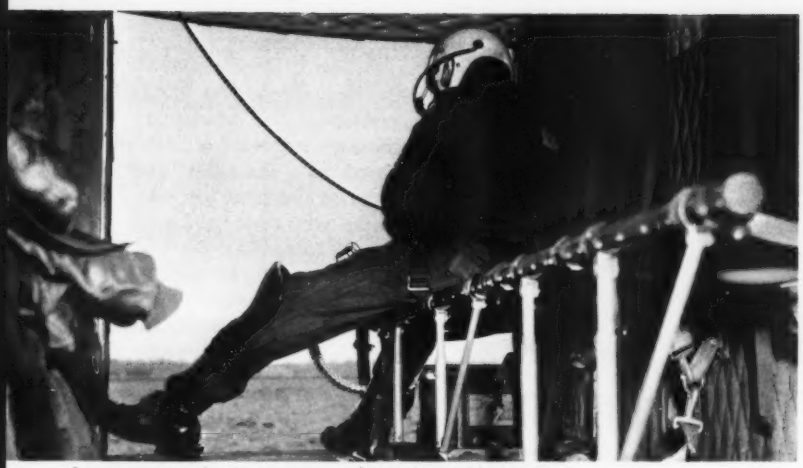
The need for such an item was first expressed at a special meeting of the United States Army Board for Aviation Accident Research at Fort Rucker in late June 1966. Natick was assigned the responsibility for assembling the necessary survival components, designing a suitable container, and procuring the complete assembly for shipment. By late November all these actions were completed and in April 1967 initial issue to Army aviators in Vietnam began.

The new survival kit assembly is attached to the web belt and carried in a "holster" that can be worn on either leg, depending on individual duties or preference. The holster has three pockets, one containing a knife (hunting, sheathed, survival, pilot, FSN 7340-098-4327) and a light (marker, distress, FSN 6230-067-5209). A second pocket provides space for the URC-10 survival radio, which is not furnished as a component, and also contains a booklet on survival.

Heart of the assembly is the survival kit itself. The top of its container can be used as a cooking pan, a flare launcher serving as the pan's handle. The container bottom houses four flares, launcher, and signal mirror, each in separate compartments. Top and bottom are secured by safety wire which shows whether the kit has been tampered with.

Inside, all components are packed in a plastic bag that can be converted into a one-quart water canteen. Tools included are a knife blade and a hacksaw blade, which also screw into the flare launcher handle, needle-nose pliers, snare wire, and a sewing kit. These articles may be used for obtaining firewood and for building snares, traps and shelters. Signaling items include the flares, mirror, marker distress light, flashlight, and a whistle.

To make foraged foods more palatable seasonings such as salt, pepper, chile powder, and bouillon cubes are provided. Where drinking water is scarce or impure, a solar still, sponge, and purification tablets may be used.



A crewman wearing torso armor and experimental leg armor

Personal and health items include an expendable toothbrush and dentifrice, mosquito headnet, a combination sunscreen ointment and insect repellent, band-aids, adhesive tape, bandages, ointments, soap, painkiller, and anti-infection tablets and devices. Pills are foilstrip packed and plainly labeled as to purpose and dosage so that the user can know at a glance what and how much he needs.

All Army aviators, except OV-1 personnel, will be issued the new survival kit assembly. OV-1 fliers are being provided new survival vests containing similar components and, for their aircraft seat, with a new hot-climate and over-water survival kit specifically designed by Natick for Vietnam operations.

The art of retrieving personnel, as a form of rescue, has come into full flower with the widespread availability and use of the helicopter. Pilots, fishermen, and ships passengers have been saved at sea by means of a hoist from a hovering helicopter. Millions have watched the exit of astronauts from their capsules in the middle of the ocean and their subsequent helicopter flight to the security and comforts of nearby carriers.

In Vietnam the need for such retrieval systems became clear as the operational use of helicopters increased, particularly when such aircraft were used for mass assaults. Initial assaults took place in large open areas where the helicopters could land and discharge troops. Where wooded terrain and jungles concealed the enemy, thus making landings hazardous, a method had to be found to deploy numbers of men from hovering aircraft.

The rescue hoist which worked well in noncombat conditions proved slow and limited when matched against swiftly striking guerrilla forces. The technique to be found had to match the versatility and swiftness of the helicopter itself. A rappelling operation, similar to that used by mountain climbers for descending cliffs, was tried with great success. It had the advantage of deploying a number of troops quickly but it did call for a high degree of training.

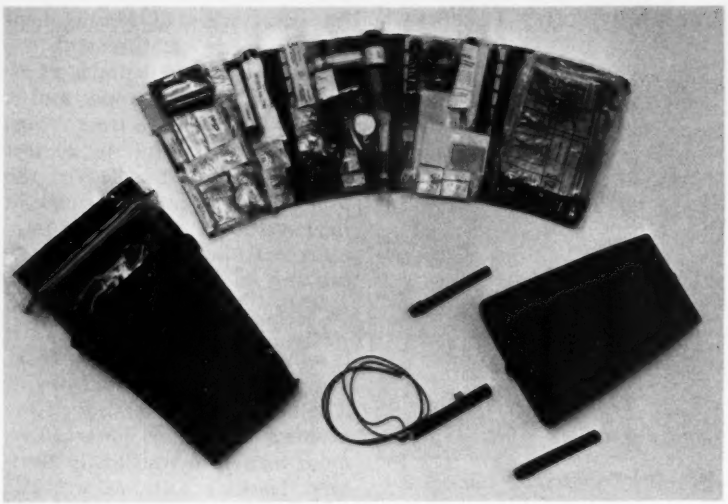
To overcome this problem, the Limited Warfare Laboratory at Aberdeen, Md., designed a rappelling device with a controlled safe rate of descent. The prototype was turned over to Natick for completion of development and for initial procurement.

The new system includes a governor, 150 feet of rope, and a harness in which the trooper sits. Rate of descent (up to 20 feet per second) is controlled by the rope's friction and the rungs of the governor. Supplies and equipment weighing up to 500 pounds can also be lowered by one man.

With the introduction into Southeast Asia of the CH-47 it became possible to deploy more troops from fewer helicopters. The aircraft, however, added the problem of how to lower 30 or more men into unfriendly territory. Natick's solution was the now familiar troopers ladder. Attached to the aft ramp of the CH-47, it can accommodate 8 or more men at a time. On some occasions, a second ladder has been deployed through the center hatch to double capability for lowering or retrieving.

Success of the troopers ladder in Vietnam has inspired numerous suggestions from pilots and combat personnel for extending its capabilities. As a result, Natick has explored numerous systems, some including the use of continuous cables, powered elevators, and detachable platforms. One concept being explored envisions a self-contained, powered, continuous mechanical ladder for lowering and retrieving personnel, cargo, and litters from jungles, mountains and other inaccessible areas. When operational the system will be 10 to 20 times faster than the troopers ladder, offer a higher deployment altitude, provide greater safety, and deliver combat troops at the ready. Loading or unloading operations will take place inside the helicopter rather than at its aft ramp door.

Other lowering and retrieval systems are being investigated for mass assaults from STOL, VTOL,



The new survival kit (above) can be carried in a "holster" (below)

and fixed-wing aircraft under any terrain or weather conditions.

In another related research and development area, Natick technologists are seeking a means for cooling Army fliers over Vietnam. Temperatures within the aircraft sometimes reach as high as 140° F., which with the prevailing high humidity hamper the efficiency of pilots and copilots.

Preliminary studies disclosed that intimate contact of ventilating air with the skin's surface is significantly better than ventilating the aircraft cabin.

A possible answer, now being tested, is a ventilated garment that can be worn under flight clothing. Its design is based on the circulation of ambient air through the garment to pick up sweat from the skin so that the increased evaporative cooling effect needed for maintaining the body's thermal balance can be realized. The circulating air is obtained from a high speed blower installed in the aircraft and powered by its electrical system.

Work on the air-conditioned garment was intensified after tests at Natick's climatic chambers demonstrated the superiority of this approach over a similar garment cooled by water. As this development is completed, air-cooled suits will be sent to Vietnam for evaluation by potential users.

New body armor protecting pilots and crews for the first time against enemy small arms fire is a Natick originated item in which the laboratories take understandable pride. Expedited design, development and initial procurement marked every step of the project so that the life-saving materiel could be furnished as quickly as possible to users in Vietnam.

The new armor is fabricated of a composite material formed into plates. The curved plates are inserted into cloth carriers and worn for front and back torso protection. In helicopters, the composite material is also incorporated onto the sides, back and bottom of the seats for pilots and copilots, who then need wear only the front torso plate for body protection. Crewchiefs and gunners wear the complete set.

Anatomically shaped armor is under development to protect the legs of gunners and crewchiefs who must fire their weapons from exposed positions.

The torso armor has been adopted for combat wear by Navy, Marine Corps, and Air Force flight personnel. Natick is continuing its research on body armor to reduce weight and improve comfort, body area protection, and ballistic efficiency.

Another protective item, a new flight helmet, is in widespread use in Vietnam. Although it appears and fits like the well-known APH-5 and APH-5A helmets, the new headgear differs radically in protective ability. It absorbs more impact energy and can withstand two impacts in the same spot at a magnitude which in other helmets causes failure at the first blow. It also provides protection against the hazard of ballistic fragmentation.

The helmet also includes a new shatter-resistant eyeshield that will not crack or break even when struck by a hammer. The eyeshield, like the helmet, offers ballistic fragmentation protection. Its cost is about half of the item it has replaced.

Wherever Natick's research, development, and engineering programs lead, its staff, both military and civilian, is dedicated to providing the very best in support of the ultimate user — the combat soldier — whether his duties are performed above or on the ground.

THE OH-6A IS HERE

Colonel Joseph L. Gude

WOULD YOU BELIEVE 172 mph, 26,448 feet sustained altitude, 2,213 miles distance without refueling? It's a fact; and these are just a few of the 23 world records which were established by the LOH, i.e., the OH-6A Cayuse — more than any other helicopter in the world.

At the time of this writing twelve OH-6As have been accepted by the Army from the Hughes Tool Company—Aircraft Division, and the production line is building up at a high rate.

Althought the little helicopter only weighs 1,158 pounds it will have armor protection for the pilot, observer, and critical components of the engine. In addition, it will carry the XM-27 Gun Kit plus 2,000 rounds of 7.62 ammunition. The OH-6A has been certified by the FAA for 2,400 lbs gross weight. I might add that when the aircraft took off for the distance run from California to Florida it weighed approximately 3,200 pounds — almost three times its empty weight.

Another interesting feature of this helicopter is the engine, which is made by the Allison Division of General Motors Corporation. It produces 317 shaft hp and weighs 135 lbs. It has four major assemblies which can be changed independently. Due to the limitation to the transmission the engine has been derated to 252 hp. This is expected to be uprated in the near future.

Improvements to the OH-6A are currently in progress with the prime contractors. A few of these major improvements are:

- Improving the drive system of the aircraft to allow continuous operation of the engine at 270 hp instead of 212 hp. The required changes will be to the main transmission.
- A new improved main rotor blade is being developed to resist erosion by sand and rain. The present blade has a .025 inch aluminum skin, and the new blade will have a .050 inch stainless steel leading edge.
- A separator is being developed to separate sand and dust from the inlet airflow to the engine. This separator will be self-cleaning and require no maintenance between airframe overhauls.

Some of the features of the OH-6A which are indicative of its technical advance are listed. First is its small size. The rotor diameter is only 26 feet, 4 inches as compared to 37 feet, 4 inches for the OH-13, and 35 feet, 4 inches for the OH-23. Four OH-6As, completely assembled, can be carried in a C-130 aircraft, and seven can be carried with only minor disassembly. Only two OH-13s can be carried in a C-130, and they require major disassembly. No OH-23s can be carried in a C-130 without major disassembly.

Second, the simplicity of this helicopter is demonstrated by the fact that it has no hydraulic system and no stabilization augmentation system, and the drive system reduces the number of gear meshes from approximately 24 that are in the OH-13 and OH-23 to only two in the OH-6A.

Third, the OH-6A has a greatly reduced drag from that of the OH-13 and OH-23. The equivalent flat plate drag area measured in square feet of the OH-6A is only 4.8 feet as compared to the OH-13 of 16 and 21 feet for the OH-23.

It is anticipated that the maintenance requirement for the OH-6A will be greatly reduced from that of the OH-13. The estimated maintenance manhour per flight hour for the OH-6A is expected to be 85 maintenance hours for each flight hour.

COL Gude is the Cayuse Project Manager, U. S. Army Materiel Command, Washington, D. C.

Some typical loads for the OH-6A are as follows:

Empty weight	1,158 lbs
Pilot	200 lbs
Fuel	400 lbs
Observer	200 lbs
Armor	140 lbs
XM-27 (2,000 rds)	268 lbs
Total	2,366 lbs

Acft, pilot and fuel	1,758 lbs
Armor	140 lbs
32 cases C rations	800 lbs
Total	2,698 lbs

Acft, pilot and fuel	1,758 lbs
Armor	140 lbs
Four passengers	800 lbs
Total	2,698 lbs

Aircraft, pilot and fuel	1,758 lbs
Armor	140 lbs
10 cases 7.62 ammo (9,200 rds)	760 lbs
Total	2,658 lbs

Also odd sized loads such as a UH-1 rotor blade.

Two devices have expanded Army aviation's capability to deliver riot control and defoliation agents

One More Job FOR ARMY AVIATION

Captain Paul Skierkowski

ARMY AVIATION, which has proved to be a jack-of-all trades with its ability to adapt to almost any requirement, has now added a new capability: riot control agent and herbicide employment.

Although Army aviation has provided chemical support in the past through employment of screening smokes, two new devices recently tested have expanded this capability to delivery of riot control and defoliation agents.

The XM-3 2.75" rocket launcher has been adapted to disperse 168 ABC-M7A3 CS riot hand grenades. The adapter kit consists of two adapter plates, an intervalometer control box, firing and power cables, loading tubes and a ramrod. The adapter plates are attached to the XM-3 rocket pods which are strapped down back to back inside the troop compartment of a UH-1D. Each of the 24 openings in the adapter plate is equipped with a solenoid-released gate which holds the grenades in the launcher tube. An ejector spring uncoils into each tube as the grenades are loaded. Grenades are loaded into the tubes by a loading tube and ramrod with the safety pins being removed before ramming the grenades into the launcher tube.

The functioning cycle of the launcher begins when the firing switch on the control box is thrown. The solenoid opens the restraining gate and the ejector springs expel the grenades from the tubes clear of the aircraft along the flight path.

With two additional rocket pods on the ground loaded, the turn-around time for a mission is very short. The only actions necessary are to disconnect the firing cables, unstrap the pods, remove them, load two full pods onboard and reconnect them. The

CPT Skierkowski is with HHC 11th Aviation Group, 1st Air Cavalry Division, APO San Francisco 96490.

pilot does not even need to shut down.

Accompanying the use of riot control agents is the problem of equipping and training aircraft crews to operate in the contaminated area. The M-24 Aircraft Crewman's Protective Mask, although affording no major difficulty, does reduce peripheral vision. This is easily overcome by turning the head in either direction and coordinating among crew members for observation in blocked areas. Initially pilots may observe a slight loss of depth perception during final approach, but with a little practice will be able to accurately judge distance.

Chemical agent effects on the crew of the dispensing ship have not been determined. For safety purposes, one pilot is masked and would be capable of controlling the dispensing aircraft should the nonmasked pilot be affected by the agent. There is no subsequent contamination of aircraft from the agent cloud.

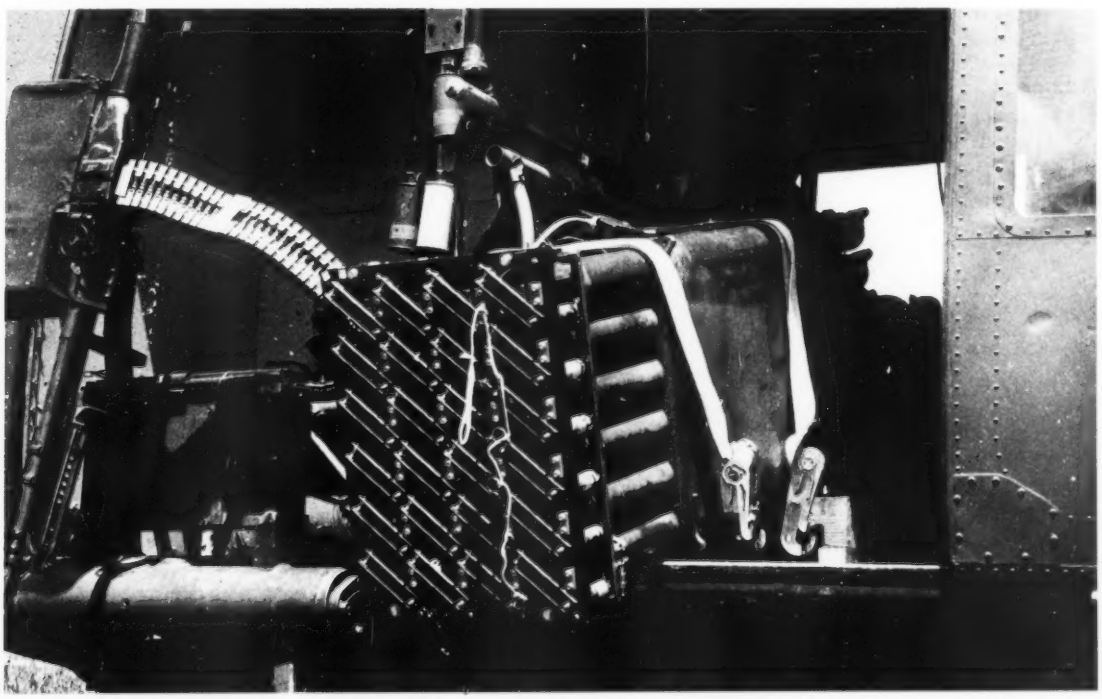
Reloading is a simple procedure

Army aviation has also enabled defoliation operations to be conducted in previously inaccessible areas. Although fixed wing aircraft are capable of performing these missions, only the versatility of a helicopter can adequately defoliate certain terrain configurations.

Initially, defoliation was conducted using a UH-1D. A fabricated spray bar system was mounted on the skids of the aircraft and defoliant was fed to it from a 55-gallon drum mounted inside the helicopter. The defoliant was expelled from the drum by compressed air from the pressure bottle of a portable flamethrower. Although this method proved to be very effective, it was limited by the amount of agent that could be carried in the aircraft and the excessive turnaround time required by frequent reloadings of drums into the aircraft and preparing the apparatus.

A solution to this problem is presently being developed by calling on a big brother, the CH-47A Chinook. Using a 500-gallon collapsible bladder, a 50 gpm fuel pump, and a spray bar rig extended from the cargo ramp, the duration of operation has been greatly extended, allowing much greater coverage in much less time.

Future developments in this area are already in the planning stage and soon a riot control agent and herbicide employment will be just another member of the ever increasing list of Army aviation accomplishments.



The XM-3 2.75" rocket launcher (above) has been adapted to disperse 168 riot hand grenades

O-1 ORIENTATION

Captain John H. Marti

THE SETTING IS one of the many airstrips in the Republic of Vietnam which serve as bases for Army O-1 aircraft. Lieutenant Delbert, newly arrived from Fort Rucker, is listening as his section leader explains his in-country O-1 checkout.

"Tomorrow, we'll go out and fire a few rockets to let you know how the system operates. I'm sure you've heard about rocket rigs, but you've probably never seen one up close."

"Well, actually sir, we got about an hour of dual firing rockets back at Rucker. We were shooting HE heads and. . . ."

"An hour of dual at Rucker? When did they start shooting rockets from Bird Dogs at Rucker?"

"I don't know, sir, but it's part of the eight week D phase program."

"D phase! What is that? Back when I went through, we graduated after C phase."

"Well, D phase is in two parts. D-1 is transition training into the O-1 and consists of 25 flight hours in 4 weeks. D-2 phase is the tactics phase and also consists of 25 flight hours in 4 weeks. We get a total of 50 hours in the Bird Dog after flying the T-42 for 8 weeks."

"Dual instruction in tactics? When I went through we spent two weeks buddy-riding, practiced loops and split S's, contoured around all over Alabama, made strafing runs on freight trains, and generally had a ball."

"I guess things have changed quite a bit since then. We got about 7 hours of dual and didn't get to do any of that other stuff except for contour flying. However I'm willing to go out and learn to do. . . ."

"Delbert, I guess you'd better fill me in on just what is going on back at Rucker in the OFWAC/WOFWAC program, since I'm getting quite a few of you young bucks as replacements."

"Captain, we got dual instruction in low-level navigation, contour flight and approaches, evasive maneuvers, high-overhead approaches, night landings to minimum and expedient lighting, wing loads and aerial resupply, rocket firing, route reconnaissance, FAC procedures, and helicopter vectoring. Of course, primary emphasis was placed on low-level navigation."

"Low-level navigation, huh? So they're still teaching that garbage about flying around on the tree-

CPT Marti was assigned to the Dept of Tactics, Ft Rucker, Ala., when he wrote this article. He is now serving in Vietnam.

tops all the time. That's a good way to get yourself shot over here. What's with those people anyway?"

"Well, sir, they explained that we would probably only fly at low level when absolutely necessary, such as during periods of low ceilings when we couldn't get to a safe altitude. They pointed out that it might be a handy skill to fall back on sometime, and they concluded their argument by saying that if they taught us to navigate well at low level, they knew that we could navigate from higher altitudes."

"I guess you've got a point there, but don't let me catch you fooling around on the deck unless it is necessary to get the job done. What types of expedient lighting did you use for night landings?"

"We used number 10 cans filled with sand and gasoline as one method. We also used Scotchlite reflector panels which were illuminated by vehicle lights or by aircraft landing lights. They showed up real well."

"Well, we don't have any Scotchlite around here, but you may come into this strip some night using the headlights of a couple of jeeps for runway illumination. As long as you're familiar with the strip location, no sweat. I'm glad they familiarized you with that. What did they teach you about FAC procedures?"

"They told us that it was primarily an Air Force mission, but that Army pilots occasionally are called upon to assist, particularly in the areas where the Marines are operating. We were briefed on the use of the TAC close air support mission record, and practiced the air strike procedures with our instructor, who was in another Bird Dog simulating an attack aircraft. We also learned how to vector helicopters to an LZ."

Things have changed at Rucker

"You won't be called upon to vector helicopters very often since they prefer to be controlled by their own people. I did hear, though, that the Marines are using Army O-1s for vectoring helicopter forces to LZs. Also when you are covering some operation you may have to vector some medevac choppers from time to time, so I guess that training was OK. What is this high overhead approach you were talking about?"

"It's a method of rapidly descending from altitude while staying in really close to the strip. Man, I really got a kick out of scaring my. . . ."

"Lieutenant, don't think that you're going to set the world on fire with your aerobatics over here. Use whatever type of approach is called for depending on the situation. I've got enough problems with hot rod aviators without everyone thinking they're supposed to split S to a landing. What did you do during your solo periods?"

"We flew with our stickmate and practiced the maneuvers we had done dual. Our instructor followed us in another aircraft and critiqued us when we got down. Of course we did a few things, too, which we hadn't done dual, like night illumination and night low-level cross-country."

"Night low-level cross-country! You've got to be putting me on!"

"No sir. We practiced flying night missions at 200 feet absolute so we'd be familiar with the problems if we had to take a night mission in low ceiling conditions, or in case the enemy start getting some radar sets."

"Well, it sounds nuts to me, but I guess it might come in handy sometime. What do you know about area reconnaissance? That will probably be your primary mission here."

"They told us that it takes quite awhile to achieve the area familiarity which you require. But we did some work in this area. We took some out-of-date 1:50,000 maps of the Fort Rucker training area; then each of us selected a 10,000 meter grid square, and we started up-dating the map. We supplemented this with aerial photos, sketches, and spot reports on interesting activities, such as lakeshore open-air dressing rooms, cars parked in the woods, etc."

"Sounds like Alabama is just the same as it used to be, Delbert. That sounds like valuable training to me. How about aerial adjustment of artillery fire?"

"We got about 2½ hours in the front and in the back seat."

"That's good, but too bad you couldn't get some more time on that. It's really important here to have accurate, immediate artillery fire. By the way, are they still trying to teach you to get radiation readings from that mickey mouse radiation simulator?"

"No sir. They've stopped practicing airborne radiological survey since it wasn't oriented toward present operations in Vietnam."

"I'm glad they finally wised up. It sounds as if Rucker has some good ideas about preparing you for this job. Of course, as more Vietnam returnees keep drifting back to Rucker, they can keep up-dating training in keeping with actual operations. That will cut down on the orientation time needed for new guys like yourself. Well, since one hour of dual in rocket firing merely acquainted you with the system, tomorrow we'll go out and start making you a marksman. And thanks for the information."

"Yes sir. See you in the morning."

Synthetic Flight Training

A QUALITATIVE materiel requirement (QMR) has been prepared describing a new synthetic flight trainer system (SFTS) needed by the U. S. Army Aviation School in its instructional program. The new system is designed to give the Army the latest in synthetic trainers and is a good example of how the Army's training needs are changing.

In the past, the Army hasn't relied as much on synthetic trainers as have the other services. The reason is mainly one of economics. The Army uses many small and slow aircraft that are cheap to operate. The O-1, for instance, will fly for less than $25 an hour. A synthetic trainer costs from $8 to $10 an hour to operate. Usually it doesn't pay to use synthetic trainers when the cost difference between them and actual aircraft is so small.

But as new aircraft are introduced into the Army, the cost of flying goes up, and the use of synthetic trainers becomes economically desirable. The new T-42s cost from $75 to $100 an hour to fly, and it costs about $375 an hour to operate the CH-47.

Dollar cost alone, though, is not the only reason the Army seems to be more interested now in synthetic trainers. Their use will help to solve many problems and improve training.

For instance, synthetic equipment is not affected by weather and traffic and can offer students and aviators the concentrated and thorough training necessary to achieve and maintain proper standards of proficiency.

In the area of emergencies, training is greater than can be had in an actual aircraft in flight. Some trainers are designed so that emergencies may be introduced while the trainee simulates flying. The student then takes the proper countermeasures while the instructor watches and grades him. In actual flight, some emergencies may be introduced by the instructor but the number and kind are restricted. In case of an actual emergency, the instructor takes over and the student's reaction and competence is seldom graded.

Availability of aircraft for training flights is an additional factor in favor of synthetic trainers. High traffic density and prolonged holding over landing areas is another at such crowded places as

The 2-B-12A is a single engine fixed wing trainer used for basic instruments and radio navigation

A training instructor demonstrates the 2-B-3 trainer at Ft Rucker

Fort Rucker. With synthetic equipment, training may be performed at anytime, regardless of the weather, crowded flying conditions, or other factors.

Edward A. Link was the first man to propose teaching fliers by using a trainer that never leaves the ground. His first model looked like a small airplane with fuselage, tail assembly, and wings.

In 1935 the Army bought the first production model made by Link's company and used it to teach pilots to operate radios and fly by instruments. The trainer was mounted on a turntable and powered by vacuum motors. From this early model, the simulators and trainers used today have been developed.

Originally all mockups were called simulators, but in aviation a simulator has gradually come to mean a simulated aircraft that is as complete as possible, especially in the cockpit area. It doesn't fly but gives the aviator the sensation that he is flying. Some go so far as to have audio-visual devices, vibrations, smoke, and smell. These simulators cost in the millions and do such a good job that a pilot can use them to transition from one aircraft to another without ever leaving the ground.

Procedural trainers are a reproduction of a certain item. They are used to teach procedures such as starting, runup, landing checks, and stopping. The instructor can also use them to introduce failures and other emergencies. Audio effects, warning lights, and instruments give authentic readings. They are a good help in saving undue wear and tear on the actual aircraft.

Synthetic trainers are used to fill the training requirements between classroom and flight line. They are mainly used to teach basic and advanced instrument flying techniques.

There are 123 trainers at Fort Rucker including those just installed in new buildings at Hanchey and Shell Army Airfields. Sixteen are 2-B-3s, three 2-B-3As, twenty-three 2-B-12As, seven 1-CA-1s, seventy-three converted 1-CA-1s, and one 2-C-9.

The 2-B-3 is the first synthetic helicopter trainer the Army bought. It is used to train aviators in helicopter basic instruments and radio navigation. The cockpit of this trainer resembles a UH-19. The 2-B-3A is similar to the 2-B-3 and is used for the same type training.

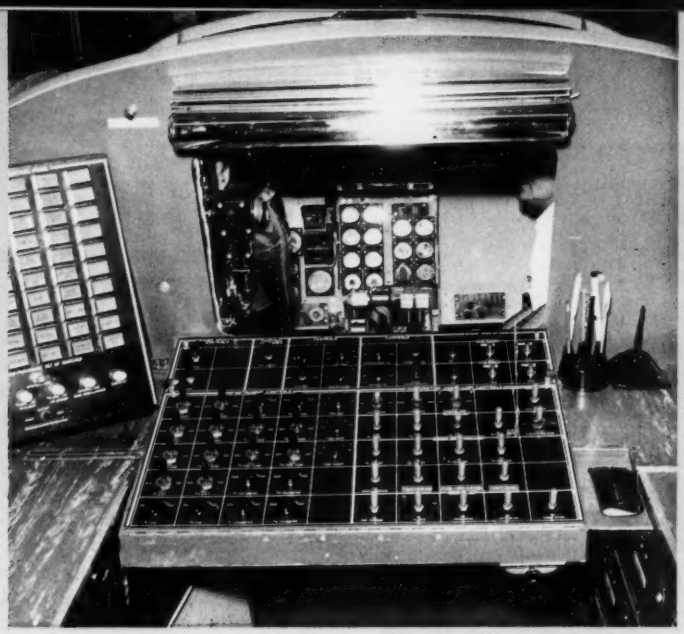
The 2-B-12A is a single engine, fixed wing trainer and is used for basic instruments and radio navigation.

The 1-CA-1 was originally designed as a single engine, fixed wing trainer. It is used for basic instrument and radio navigation. One at Fort Rucker has a flight direction system (FD 105) and is used for OV-1 training. Although these trainers are old they are rather versatile and most of those at Fort Rucker have been converted to helicopter trainers.

The 2-C-9 is the OV-1 cockpit procedure trainer. It looks like the OV-1 cockpit and, except for walk around, it can be used for checks, etc.

The new synthetic flight trainer system described in the QMR would use modern hardware such as digital computers, making the system more versatile because it could accept different programs from different aircraft configurations.

It would use the modular concept. In other words, it would be made up of units that can be attached to each other as needed for different training requirements. For example, a synthetic training device in the CH-47A transition course would consist of a computer module, a CH-47A operational flight trainer (OFT) module, an instructor module, and a cockpit motion platform. Also required would be the appropriate information (program) for the computer module.



Above: The 2-C-9 which is used for OV-1 training in cockpit procedures and inflight emergencies

Left: The 1-CA-1 with the FD-105 flight duration indicator is used in OV-1 training

Below: The 1-CA-1 which is used for training fixed wing students

Should the need change to that of a device for some other transition course, the CH-47A OFT module would be replaced by an appropriate OFT module. The only other change then needed to make the equipment into a new trainer would be the computer program.

The SFTS would replace most of the rotary flight trainer equipment now being used and would offer in addition a CH-47A OFT that is not now available.

The USAAVNS system would consist of one computer module, 31 instrument trainer modules, 32 cockpit motion platforms, one CH-47 OFT module, and as many instructor modules as needed. The 31 instrument trainer modules are based upon a ratio of approximately one module for each 16 students in training, an average student load of 500 with each student taking 20 hours of synthetic training and 160 hours of training time per module per month.

There may be field units, each consisting of one computer module, 1 to 4 instrument trainer modules, one instructor module and 1 to 4 cockpit motion platforms.

The mobile system would have one computer module, CH-47A OFT module, instructor module, and cockpit platform. It would be capable of going wherever it was needed.

By necessity, QMRs take a long time before they are acted upon. However, the Aviation School feels it needs new trainers as soon as possible.

In any case, the wheels have started turning to give the Army a new synthetic trainer system. Before they stop, it is likely the Army will have a new system that is more responsive, flexible, reliable, and efficient in the use of instructor skills.

CRUSADE FOR AIRMOBILITY

Colonel Maurice G. Miller

A nonrated infantry officer looks to the future with a thought-provoking idea on large scale employment of airmobile forces

THE UNITED STATES can defeat any army who attacks (is the aggressor) without the use of nuclear weapons provided that:

- The U. S. Air Force is strong enough to control the air over the battlefield.
- The U. S. Army converts most of its divisions to airmobile divisions.
- The U. S. Air Force has sufficient cargo aircraft to keep fully supplied the Army's airmobile divisions.

I know that very few people will agree with the above statement. If it were the consensus of opinion, then we would not be arguing over whether we could afford more airmobile divisions, continue to maintain two airborne divisions, continue to spend large sums of money to develop the main battle tank for 1970, and continue to increase our armored strength in Europe.

For this concept to be successful, the airmobile army must be supplied by air from bases which cannot be reached by the enemy. The airmobile Army must be free to operate without any terrain considerations. It will fail if it has to secure terrain.

The tactics to be employed by the airmobile army are simple: Cut all enemy supply lines and destroy all supply depots, concentrating first on fuel and second on ammunition. Never engage a superior force, but destroy its supply line. In Europe, for example, suppose our two corps were airmobile ones and each had three airmobile divisions. If we were attacked, I visualize that allied armies would fight a delaying action, while our two airmobile

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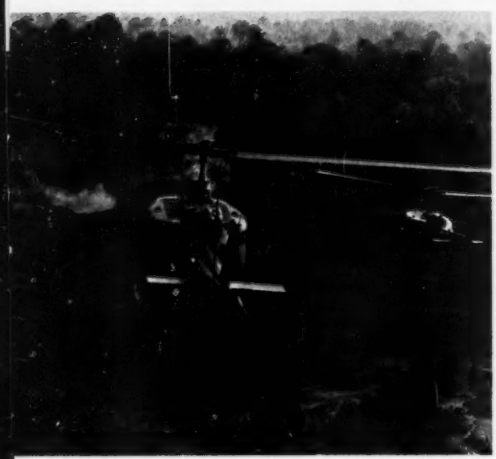
COL Miller is HQ commandant and CO, Special Troops, Headquarters, 4th U. S. Army, Ft Sam Houston, Texas.

corps were destroying supply lines, hitting as close to the rear of the enemy's main force as could be done without exposing themselves to a major engagement.

Numerous passes through mountainous areas and the many rivers in Europe would make excellent places to cut enemy supply lines. If the enemy brings up sufficient force to dislodge an airmobile force, it simply pulls out and cuts the supply line farther to the rear. A third airmobile corps arriving from the United States, with some or most of its units based on and launched from ships, could concentrate on the



destruction of enemy airfields, the supply lines of enemy reserves, the destruction of enemy supply depots and the securing of supplies which the Seventh Airmobile Army could use.

For these tactics to be successful, the enemy must also be denied the use of friendly fuel and ammunition, either by their destruction or protected by our allies conventional forces until the enemy is rendered impotent.

Within 3 to 7 days after the war has started, the enemy should be unable to advance. Most of his tanks and artillery will be useless since he cannot move them, and

In event of a large scale attack, Allied troops would fight a delaying action (above) while the airmobile divisions attack as close as possible to the enemy's rear (left) to destroy his supply lines and depots, reserve units, and airfields. When the airmobile divisions seize control of the enemy's communication lines, other Allied units (below) move into the final phase . . .

his communications will commence to fail. Even if he can initially live off the country as far as food and water are concerned, food shortages will soon add to the deterioration of his army.

As soon as our airmobile army has complete control of the enemy's line of communications, it should be able to release units for the final phase, which can be either piecemeal destruction of the enemy forces or seizure of strategic points in the enemy's homeland, particularly if any are left relatively insecure.

Now that I have given you the basic blueprint, let's look at an imaginary action as depicted by sketch A which points out some of the following basic rules:

If the enemy defends his key defiles with such strength that an airmobile battalion cannot defeat him, then another point in his supply line must be selected. Let the Air Force pound the strong points.

Should the enemy attack in sufficient force to dislodge an airborne battalion astride a supply line, then the battalion should leap-frog the enemy attacking force and cut its supply line.

As soon as the main body of the enemy is across a major river all bridges, bridging equipment, and ferrying equipment should be destroyed.

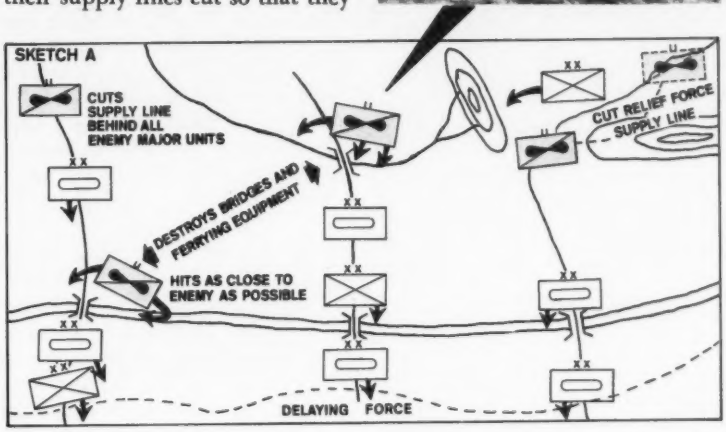
Do not engage major enemy combat formations until his tanks and artillery have been immobilized because of lack of fuel.

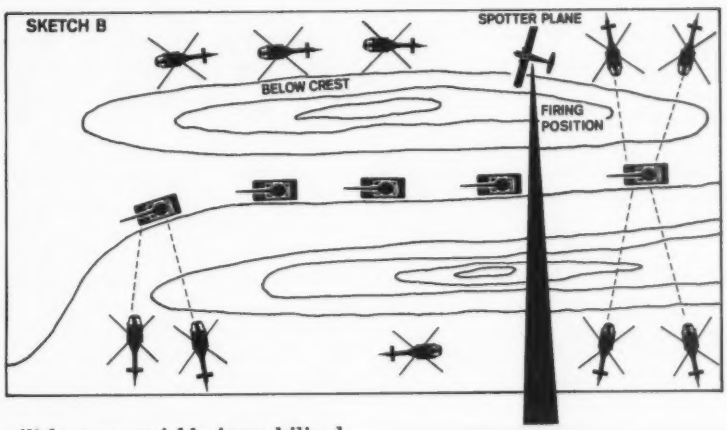
When necessary, enemy armored or motorized formations can be air ambushed and destroyed (see sketch B). Briefly spotter planes direct armed helicopters into positions so that they can pick off tanks and trucks one by one.

Air ambushing and strafing should be used to maximum to delay or destroy enemy relief columns so that airmobile units can be moved to new locations. (Primary ones being astride the relief column's supply line.)

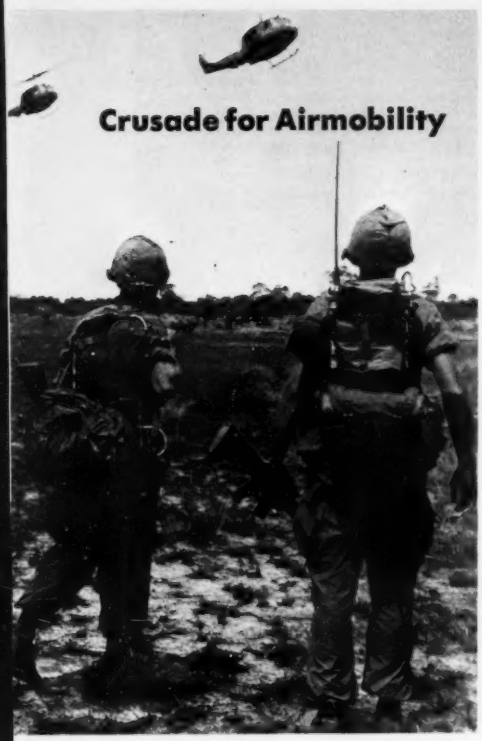
Forward airmobile supply bases should be as far removed from enemy formations as is possible and should be subject to immediate movement.

Enemy forces attacking airmobile supply bases should have their supply lines cut so that they will become quickly immobilized.


SKETCH A
CUTS SUPPLY LINE BEHIND ALL ENEMY MAJOR UNITS
DESTROYS BRIDGES AND FERRYING EQUIPMENT
HITS AS CLOSE TO ENEMY AS POSSIBLE
CUT RELIEF FORCE SUPPLY LINE
DELAYING FORCE



Although our present airmobile division (1st Air Cav) now being battle tested in Vietnam is probably a good basis for the establishment of our future airmobile divisions, I feel that in organizing these divisions we should use as a basic premise that the division either walks or flies. It should have very few organic vehicles. If



it needs vehicles for a specific operation they are attached. Armed helicopters and Air Force fighter-bombers will give the division its firepower, particularly during the initial stages when the tactics are to destroy and run.

These premises should considerably reduce the cost of an airmobile division. Once the enemy cannot move its artillery, its tanks are useless, and it has hardly any communications, then our armored and mechanized divisions and our airmobile divisions beefed up with additional artillery should move in for the kill.

The above tactics are the only ones that will allow a very small force to defeat the huge tank and mechanized armies that Russia can field.

If you are still not convinced, let us quickly review history. There have been many battles where a numerically inferior force defeated a large one because of a well executed plan which couples surprise with mobility, food or water was denied, or the supply system of the superior force failed.

The most obvious historical example that comes to mind is the defeat of Napoleon's Grand Army in Russia in 1812. An invincible army that was beaten by the Russian tactics of scorched earth and space until the Grand Army's supply system failed. An airmobile army does not need to give up much space and can cause a supply system to fail in weeks instead of months with even more disastrous results.

Now let us look at the battle of Hattin, 1187 AD, wherein Saladin defeated the Christian Army under King Guy, because Guy ignored the importance of water. Without water Guy's troops became exhausted and began to straggle. When they were attacked, complete exhaustion through lack of water had beaten them. In today's modern warfare, oil is the life blood, much easier to deny than water.

Hannibal's light, fast Numidian cavalry could probably have been defeated by most forces, even those inferior to it in size if it had chosen to stand and fight. However, its tactics were generally very successful. It would hit at lightning speed where the enemy least expected and then withdraw before the enemy could retaliate. It was so fast that it could not be overtaken in pursuit. Our airmobile division has these same basic characteristics, except that its mobility is tremendously greater as is its fire and staying power.

In early times through the 19th century cavalry was the queen. The tank born in World War I became the queen in World War II. In Vietnam, we have the birth of the airmobile division. In any future war, the airmobile division will be queen.

As we progress from helicopters to mach 1 VTOL aircraft and thence to faster more efficient aircraft the mobile division will become the absolute *king* of the battlefield.

I recommend we convert our airborne divisions to airmobile ones at once. I can no longer envision a situation where paratroopers would jump into combat. We do not have to keep airborne units in the Army because of airborne pay. An equivalent pay for airmobile personnel can be developed.

Our European divisions should be converted next since Europe is where the airmobile division can be best utilized. As long as we can control the air, the Russians will not dare to attack. He would realize that NATO ground forces could delay his attack long enough for the United States airmobile forces to destroy his supply lines. Thus it would be only a matter of time before his armies were destroyed.

This is the only way outside of nuclear war that the United States can hold the communists at bay at a very nominal cost. I feel that study will prove that the U. S. would not need large reserve forces, because one U. S. airmobile army of 9 to 12 divisions would deter and, if necessary, stop an attack in any part of the world.

If a country like Russia were so foolhardy as to attack, its highly mechanized army would soon be worthless. Even in a nuclear war airmobile forces would be king. Their high mobility would make them difficult to hit, and they can readily move to miss fallout.

As I have said before, I believe the airmobile concept is our salvation. It is also the cheapest form of defense we can buy.

Not only would the IPs not listen to my sad story, but I found that I did not remember all there was to remember about a steep approach, normal approach, and traffic pattern

Tactics IP! WHY ME?

Major Richard H. Marshall

AS THE guard waved me through the gate at Fort Rucker, memories rushed through my mind of several years back when I departed through this same gate as a proud new Army aviator. These years have not been easy, but the experience gained has been invaluable. Korea, 11th Air Assault, and Vietnam were all behind now and a sense of well being surged through me at the prospects of the many job assignments which I am qualified to perform. I had listed Rucker as my first choice on the preference statement, so it was like coming back home.

As I drove along familiar terrain en route to G-1, I began to map out plans for the next year or two. "Now, let's see, it will take at least a half day every day to update the boys here on the way we do it over there, then I'll have to arrange my afternoons to allow for work on my masters and a little golf. When they look at my form 66 they will ask what job I want, so I had better G-2 the situation so I can plan those long weekends with the wife and children. Yes, it is good to be back home."

As I left the officers' club parking lot for the headquarters building, I couldn't help but smile at the prospects of those fine "Happy Hours" I'd soon be enjoying. The personnel people were friendly types, but two things happened

MAJ Marshall is Deputy Airfield Commander, Employment Division, Dept of Tactics, Ft Rucker, Ala.

I realized it was the most rewarding job I've ever had

that seemed a bit strange. First, they did not show a hint of excitement when they looked at my form 66. Of course they see 66s everyday, so it is possible that they missed all the splendid feats listed on the back side. Second, they had not asked what I had wanted but merely had said, "We are assigning you to the Department of Tactics." There is no major problem though, as I will just have to work my plans into this department.

The DOT people were happy to see me, but did not seem to hear me when I told them the job I had picked. Just as I started to revoice my request, I was told that the colonel would see me now.

We talked briefly about Vietnam, the housing situation at Rucker, the many changes that had taken place since I had last been at Rucker as a student. "One of the greatest changes you will note," he said, "is within the Department of Tactics. All instruction is Vietnam-oriented in the most realistic manner possible to parallel the situation the new aviator will encounter in Vietnam. The student is told the first day that he is a replacement assigned to an airmobile unit in the Republic of Vietnam. Due to the combat situation he has two weeks to train before his first combat mission. This is where your job will start as a Tactics IP."

My jaw dropped as I blurted, "Tactics IP! Why me?" With a knowing look he answered, "You are assigned to the Employment Division because this is where we need you most."

I rendered a salute, stumbled from his office, and groped my way to my awaiting car to report to the Employment Division chief at Lowe AAF. My feeling of well being had been shattered. I had visions of Air Assault II everyday now — night formation, day formation, low level, and airmobility. Was there no rest for the weary?

By the time I reached Lowe I had mustered some composure. Reporting to the division chief, I indicated that I was ready to start work if he would just cut the IP orders. I was informed that IP orders would be cut if and when I successfully completed a methods of instruction course which was conducted by the Tactics Standardization Branch, approximately 3 weeks in duration. He went on to further enhance my day by telling me that I could expect long days and nights of work, but it would probably be the most rewarding job that I had ever had.

Hopes of work on my masters, the golf course, and Happy Hour were replaced with the realization that the men at Rucker had not been standing by awaiting my arrival, but had caught up with the war in Vietnam many months before. I felt some despair that I had not set the world on fire today, and tomorrow did not look much better. In my desperation, I tried to find some condolence from some of the IPs who had been around awhile. I found that they had plenty of time to talk about the training program or furnish any information that would assist me in my new job, but there was no time in their busy schedule to listen to a sad story about a tremendously tal-

ented aviator who wanted to play.

Three days after I began MOI, my ego had been ruptured in all four quadrants. Not only would the IPs not listen to my sad story, but I found that I did not remember all there was to remember about a steep approach, normal approach, and traffic pattern. My autorotation pitch pull was too low, and I left out ten or so items on my cockpit check. The greatest shock of all was the fact that I could not seem to talk and fly the aircraft at the same time. I showed the first ray of hope when I admitted to myself that I had drifted away from standardization over the years and that although I could fly the aircraft, I had a long way to go before I would be an IP.

Finally, with hours of unselfish help from a dedicated IP, I completed MOI and reported to a flight for the assignment of my first four students. It is a division policy that, regardless of your job assignment, you take four students through a complete course so you will better understand the program. I turned to the older IPs for daily guidance, finding them always more than willing to offer any assistance they could. There was no time left in my schedule for my sad story, so as time passed so went the story.

It took only one flight with my new students to make me realize that, regardless of how long the day, I always had homework to accomplish before the next flight. The students' motivation, attitude, and desire for knowledge were too keen to spare my conscience the horrible feeling of guilt might I fail to answer any question correctly.

The first two weeks of the four week class were oriented toward preparing the student for the field training exercise, which is conducted the last two weeks. Major areas of instruction are night and day formation flying, low-level navigation, and all related fields associated with airmobile operations. As par for the course, I found myself fighting from day to day to stay up with the team and see daylight from behind what seemed like tons of paperwork. I found myself saying, "Lord, give me the ability to take a good aviation student and not make a poor aviator of him." It seemed just a few days that the students' final checkride was over and passed, and the FEX had ended.

It was the last week that all seemed to fall into place. I suddenly found the students working as a combat team. I was merely riding along as an overseer. It dawned on me on one such mission that they were ready to join their combat unit. I had a feeling of accomplishment that possibly only the flight instructor feels at such a time. All at once, like a bolt of lightning, the work in MOI, the long hours, the scares, the uncertainties, and the study seemed so small a price to pay for the reward I was receiving at that very moment. The division chief's words rang true as I recalled what he had said: "The most rewarding job that you have ever had."

As the end of course flyby took place, and we prepared to receive the next class, I looked at the other IPs and felt a renewed respect for these men. Now I knew the secret why they did not have time to hear my sad story. I now belong to a group that feels pride beyond description. They enjoy the fact that they are giving of themselves to the war effort. They give the only gift that can be given to a man en route to combat: knowledge and training gained from combat.

As the new class comes in I find myself saying, "Tactics IP! Why not?"

General Vien's Wings

General Cao Van Vien (left), Minister of National Defense, RVN, was made an Honorary U. S. Army aviator by General William C. Westmoreland (right), Commanding General U. S. Forces, in ceremonies at Tan Son Nhut. Standing in background with camera is CW3 Martin P. Merz, 1st Aviation Brigade, who instructed General Vien in the art of flying a helicopter.

ARMY AVIATION MAINTENANCE

The following "letter" was written by COL Francis M. McCullar when he was Director, Department of Maintenance Training at the USAAVNS. It is in response to a request for a maintenance article to commemorate Army aviation's 25th anniversary

DEAR SIR:

Thank you so much for your letter inviting me to express my views on the past, present, and future of aviation maintenance training. You have touched a soft spot in my heart and there is no subject upon which I had rather speak. All too often the subject of maintenance and maintenance training is overlooked or forgotten entirely until the machine quits running. Then it is too late!

People seem to have a natural built-in antipathy toward maintenance. This is very unbecoming to an aviator, one whose own life, life of his crew, and passengers depend not only upon his flying ability but also upon his knowledge of the aircraft itself. We should convince our student pilots that their skillful handling of the machine — a smooth touchdown, careful use of the brakes, and other controls, proper use, not abuse, of the powerplant — are all in themselves *maintenance.*

As a matter of fact, the Army definition of the word maintenance includes "all action taken to retain materiel in a serviceable condition or to

restore it to serviceability. It includes inspection, testing, servicing, classification as to serviceability, repair, rebuilding, and reclamation. All supply and repair action taken to keep a force in condition to carry out its mission. The routine recurring work required to keep a facility (plant, building, structure, ground facility, utility system, or other real property) in such condition that it may be continuously utilized, at its original or designated capacity and efficiency, for its intended purpose."

In looking backwards upon 25 years of aviation maintenance training, I shall comment only briefly. Over this quarter century, we have made progress, considerable progress, and most of it in the proper direction. In the early days of Army aviation when the L-4 Cub was the hottest thing going, the student aviator and the student mechanic were trained to identical POIs. That is, the pilot as well as the mechanic split cases, replaced jugs, timed magnetos, made complicated splices of wing spars, stitched and doped fabrics, and disassembled and reassembled the aircraft.

Student aviators were trained apart from the mechanics as a guarantee that they would actually perform and learn the necessary tasks. There was good reason for this, for it was not unusual at all for the aviator of that time, flying alone and with ground facilities far between, to be his own crewchief, maintenance officer, supply man, and mechanic. Besides being trained to perform these functions, he was also properly equipped and each was issued his own personal roll of simple hand tools.

People knew little or nothing of what we regard today as echelons or categories of maintenance, and aviators and mechanics did just about what they thought they could get away with. This may have been admirable in some respects but not so in others. In at least one instance that I can cite, a young lieutenant and his sergeant were sadder but wiser for their experience. Their aircraft had suffered a damaged wing and engine. They obtained the necessary parts by whatever means, scrounging, trading, and borrowing, and then completely rebuilt the aircraft.

Time came for the test hop; the two of them climbed aboard and tooled off. After 30 minutes or so of smooth and uneventful test flight, the pilot closed the throttle to descend to a low level, the better to reconnoiter a prospective fishing lake. Reconnaissance completed, the pilot opened the throttle for the climbout but the engine remained at idle. The softest place that they could reach was the top of a tall pine tree from which the aircraft and its crew ingloriously fell to the ground. The aircraft was a total loss. The lieutenant and the sergeant were unhurt due to no fault of their own. Investigation revealed that neither the pilot nor the crewchief had bothered to play the role of technical inspector and one vital safety in the throttle linkage had been left off.

Separation of pilot maintenance training and mechanic maintenance training, the establishment of recognized echelons, and a system of technical inspections evolved and developed over the years that followed. These things were necessary for many reasons. The first, quite obviously, was that airplanes like automobiles advanced with the times. No longer was it in the best interest to train the pilot to be a "jack of all trades," for each trade was beginning to require its own specialist.

Second, the rising numbers of makes, models, and types of aircraft together with growing organizations and the development of TO&Es calling for many aircraft dictated new concepts of maintenance training and maintenance employment.

Between 1954 and 1956 when Fort Rucker as the Aviation School and Center began to take over the mission of aviation training from Sill and Gary AFB, the pilot and the mechanic began to go their separate ways. It was during this time that mechanic training was also begun at Fort Eustis in the higher skill levels and in component repair.

Insofar as the pilot's maintenance training went, a paradox began to show itself. As the aircraft became more complicated and difficult to understand, the pilot's maintenance training was reduced. This process took place gradually as hour by hour of maintenance training time was given over to new subjects, such as radio navigation, tactics, and attitude instrument flying. Today the maintenance training given to the new aviator is almost a misnomer, for really what he is getting is only an introduction to the operation of the various aircraft systems. Nowhere in his training is he allowed really to open an engine, change a tire, or rig the controls. Is this good or bad? Opinion varies.

To make another comparison with the automobile we can say that there are millions of successful drivers whose knowledge of automobile maintenance ends when they pull away from the gas pump. My wife (and yours?) is a prime example. On the other hand consider how much more accomplished is the driver who is fully knowledgeable, trained, and equipped to do his automobile maintenance.

The pilot whose knowledge of his machine extends only to the throttle belongs in the ranks of the unprofessional.

I have mentioned the enlisted mechanic training opening at Fort Eustis, but I should like to concen-

trate a few minutes on the enlisted mechanic training at Rucker. In the past few years we have made considerable change in our programs, feeder patterns, and scheduling. Rising Vietnam requirements and the simple economics of training made these changes not only desirable but mandatory. The mechanic training for the UH-1 will serve as an example.

In previous years this man was trained first in a basic fundamental maintenance course in which he learned that a magnet has two poles and that the aircraft operates generally so. Following this course, he was fed into an intermediate 5-week course which qualified him as an organizational mechanic on the two bubbles, the OH-13 and OH-23. Only after this course did he see his first UH-1 during another course of 3 weeks.

When we began to look for course improvements, we suddenly realized that this man who would be employed on the UH-1 had little need-to-know of such things as reciprocating engines and different rotor systems that he had been taught in the intermediate course. We discovered that we could extend the UH-1 portion of this man's training by one week and thereafter bypass the intermediate course. This concept became known as the "direct flow."

Besides giving us a better UH-1 mechanic, it allowed us (from the net saving of time) to add a week of tactical training. Tactical training includes door gunnery, an urgent Vietnam requirement. The direct flow proved so successful in the case of the UH-1 that it has since been implemented in all of our courses and the intermediate step entirely eliminated.

At the same time that the direct flow was in gestation, the idea of a "daily flow" was conceived. When Army aviation training went off a peacetime basis and went to mobilization rates to sustain Vietnam, requirements for mechanics doubled, even tripled. The first solution that most people have to offer for this problem is simply to go to a double shift. DOMT looked for better ways. We discovered that whereas we had started a class every week we would start that same class twice a week, three times a week, even five times a week. For the past two years we have done just that in the fundamental course, the UH-1 course, and more recently the light fixed wing airplane course started a class every day.

The daily flow sets up a real production line. When once fully going, it naturally follows that a class is graduated every day and that the entire program of instruction is taught every day, all five weeks of it.

Aviation maintenance training is very expensive in terms of training aids, for a large number of aids are aircraft. The sight of such costly items going unused for long periods of time disturbs everybody. The daily flow turned out to be the solution for efficient utilization, for under this concept every training aid is used to the maximum.

We have visited a number of training facilities in the Army and the other services, and commercial and civilian schools, and have had in turn hundreds of visitors go through our operation. The daily flow so far as we can learn is unheard of outside Fort Rucker.

Another fallout from the daily flow has been lower attrition rates without a decrease in quality of the graduate. This bears a little explanation. In the past when class starts were as infrequent as once a month, recycling was difficult and retesting unheard of. With the daily flow, a student can be set back for one examination or for any day or days of instruction. As a result of his repeating certain blocks of instruction and being retested, many men now graduate who a short while back would have been eliminated, not necessarily for cause but for lack of opportunity.

In our search for ways and means to reduce the number of aircraft required in our training program we formed the USAAVNS Training Equipment Study Group. This group, which became known as the "Ad Hoc," visited and studied training methods and techniques at other aviation schools, both military and civilian. The group made a number of recommendations which were approved and implemented, but first among these was the idea that we could get far better use from our training aid aircraft through disassembly. Again the UH-1 serves as an example.

For years we had limited our ratios of six students to each training aid aircraft. Any more than this merely caused confusion and interference. The obvious solution had escaped us but now we had the answer. It was merely to disassemble a certain number of aircraft into their major components: the main rotor, the transmission, the engine, the fuselage, and the tail boom. Now instead of six students per aircraft, we could get five times that many or more.

Perhaps the most eye-catching of our innovations is the manner of handling instruction having to do with the tail boom. In this particular block of his training, the student mechanic is taught the removal and replacement of the tail boom to the

main body section. Of course, all adjustments, alignment, and rigging must be accomplished at the same time. Under "the whole aircraft" approach, the fuselage merely served to hold in position the mounting bolts, shafting, and connections. This is a rather expensive mount.

We replaced the fuselage with a couple of dollars worth of angle iron bolted to the wall of one of our shop buildings, stubbed shafts and cables were put in place, and now the student mechanic performs by removing and replacing the tail boom to the shop wall. The fuselage serves in other instruction.

The study also revealed that it is unnecessary to have a particular model of the aircraft to teach that aircraft. That is, certain substitutes are possible. By these means the study showed that our UH-1 fleet could be reduced from 41 aircraft to 30 aircraft, handling the same student load. Though it pains some to see perfectly good aircraft dismantled, the savings are substantial and justified. The flying fleet gains and the mechanic training is improved. (A more detailed report of this study written by LTC Clifford S. Athey appeared in the April issue of the AVIATION DIGEST.)

Another recent change in our aviation mechanic training is known as "user/support." In October 1963, CONARC directed the Transportation School and the Aviation School to study the feasibility of training a student mechanic beyond the organizational level and through the direct support level, or roughly the first through third and partial fourth echelon. The study concluded that such training was at least feasible because there was considerable overlap, duplication, and correlation. Quite naturally a user/support course would be somewhat longer than either the organizational level course or the direct support level course, but overall there were direct savings and other benefits to be realized.

For one thing the assignment of a man so trained is far easier and is less restrictive. The study was duly approved by CONARC, and later DA, and user/support level training was inauguarted on the UH-1.

This proved timely for it coincided with the buildup in Vietnam. As a matter of practice, mechanics trained to the user/support level are assigned and interchanged between the airmobile companies and their attached KD teams with far better success than were there two levels of skills.

There has been no implementation of user/support training to other aircraft except those recently procured, just now becoming a part of the Army inventory.

Let us look now to the future of maintenance training. Frankly, I can see little change in our approach to aviation maintenance training for the aviator, merely a continuation of our present systems orientation. Training time will allow little more.

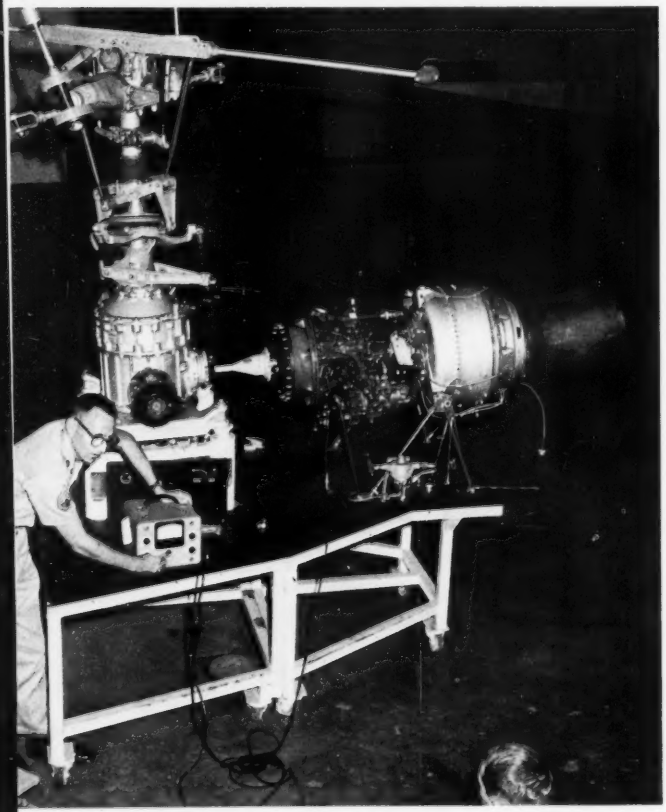
This means then that the individual aviator himself must devote more study to his -10 and to the other technical manuals pertaining to his aircraft. He will never, never learn enough. He will not live so long, but the more he learns the longer he might live. There is so much more to flying than pulling pitch that it is frightening.

To my notion, one of the greatest problems existing is on the enlisted side; that is, our inability to retain the trained mechanic. This goes for the new man as well as the old. In the 67 series MOS, organizational maintenance, only 14.08 percent of the Regular Army first termers and only 2.04 percent of the drafted men re-up. Studies and reports show a similar situation among the older Regular Army men. Only 51 percent re-up. They are getting out and we are not replacing them. Unless something is done and done quickly, I feel that our experience level will drop to that of the recent graduate. Variable reenlistment bonuses, crewchief badges,

The direct flow maintenance training system proved so successful in the case of the UH-1 that the Department of Maintenance Training has since implemented it in all of its courses

and flight pay certainly are incentives and have had beneficial effect. Something more must be done and my thoughts run along these lines.

The young aviation mechanic today returns from his first tour to Vietnam to find that in his homeland he is virtually without a home. There is simply little opportunity to assign him in his MOS because of our reliance upon contract maintenance and because there are few aviation units other than those being formed for deployment. I propose that this young man in return for his reenlistment be sent to further higher level maintenance schools. I can see in my mind's eye a school system of three or more levels. First, the organizational or now user/support. Second, the first phase of what might be called the Airframe and Powerplant Minus Course. This is a new term coined right here at Fort Rucker to describe a course of instruction designed to train and equip the man for his FAA A&P License (-). The minus refers to those FAA skills for which the Army has no use, such as woodwork, fabric doping, and electrically operated and wooden propellers.



Disassembling a certain number of aircraft into major components facilitates maintenance training at USAAVNS. Here an instructor demonstrates use of an analyzer on a UH-1 engine

Our estimates are that such a course might run to 32 weeks. It could be done in phases or stages separated by periods of duty in the field and upon successive enlistments. In the end we would have a man trained and experienced. True, as he approached full A&P qualification, he would be more susceptible to recruitment by industry, but on the other hand a number would be sufficiently committed that it might be easier for them to go for 20.

I believe such a plan has merit and warrants our further study and support. The opportunity for further schooling coupled with the opportunity for career advancement should be attractive to an appreciable number of our first termers. And not only would it give us a better trained and more highly skilled mechanic, but also it would contribute to the CONUS sustaining increment, or CSI. This is the latest term applied to what has been known as the rotational base.

Another problem of the future that is receiving our present attention is the rising cost of aircraft and training aids. The day will come when we cannot afford to ground production aircraft for mechanic training and there will be insufficient funds to buy the necessary training aids, either actual components or computerized trainers. The Air Force years ago had to face up to this problem and the Army would do well to learn from their experience and example.

Basically, the idea is this. When the mechanic reaches that stage of his training where an actual flyable aircraft is required, he uses one assigned to a unit. His training though is conducted by training teams who are responsible to and report to the school system. We recently made a proposal along these lines, offering to maintain the Cobra fleet at Fort Stewart with undergraduate students working under the supervision of instructors from the Aviation School. The idea was apparently too new to be acceptable, but we have planted the seed and are patiently biding our time.

These are my thoughts of yesterday, today, and tomorrow. I hope that you feel they might be of some value. If you do and wish them in the form of an article for the AVIATION DIGEST, please let me know.

Sincerely yours,
F. M. McCULLAR
Colonel, Infantry
Director, DOMT

Test your skill

Aircraft Photo Quiz

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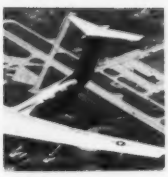

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SOME OF THE aircraft pictured here you may see every day. Perhaps you fly or maintain them. But how much do you really notice? How good are you at aircraft identification? Try yourself and see.

This same aircraft photo quiz was given to two aviation-oriented groups.

The first group, composed of 41 enlisted men, identified correctly 46 percent of the aircraft. So they missed 8 of 15 aircraft shown. The highest of the group scored missed three.

The second group, 29 officers, gave an average of 11 correct answers out of a possible 15 correct, missing approximately 25 percent. Three of those taking the test correctly identified all but one of the aircraft. No one scored 100 percent.

Discover how quick your eye is but watch out. Some of these photos are tricky. To give you a hint, they're not all current—or American! *Answers on page 30.*

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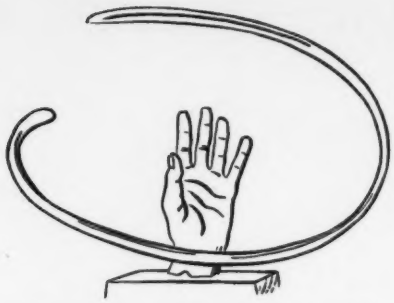


MAJ Bruce P. Crandall (right) was named winner of the Avco-AWA Helicopter Heroism Award (above) at the 29th annual meeting and news conference Aviation/Space Writers Association this spring in Las Vegas, Nev.

Army Aviator Receives First Avco-AWA Helicopter Heroism Award

MAJOR BRUCE P. Crandall, a veteran of Vietnam combat, has become the first recipient of the Avco-AWA Helicopter Heroism Award. This award will be presented annually to a pilot, crewmember, or other individual for outstanding heroism involving use of a helicopter the previous year.

Major Crandall received the award at the annual meeting of the Aviation/Space Writers Association. The award is sponsored jointly by Avco Corporation and the association, known as AWA.

The Army helicopter pilot was cited for his rescue of 12 wounded soldiers, making two flights under intense enemy fire and in total darkness with only a flashlight on the ground to guide him into a small landing zone surrounded on three sides by tall trees. Major Crandall is the holder of the Distinguished Flying Cross with cluster, the Bronze Star and the Air Medal with 17 clusters. He has been recommended for the Silver Star for the same action that led to his winning the Avco-AWA Helicopter Heroism Award.

Major Crandall's heroic action occurred on 31 January 1966, during the battle of Bong Son. At the time, he was commanding officer of Company A, 229th Aviation Battalion (Assault Helicopter), 1st Cavalry Division (Airmobile).

Here is Major Crandall's story as told by LTC Robert S. Kellar, commander of the 229th Aviation Battalion:

Shortly before dark Major Crandall led a flight of UH-1D helicopters carrying reinforcements to the 1st Battalion, 7th Cavalry, which was heavily engaged with encircling enemy forces north of Bong Son.

In the ensuing engagement the ground unit sustained numerous casualties which required medical evacuation. At approximately 1830 hours the ground commander notified Major Crandall of this requirement. He was advised that the casualties would have to be carried a considerable distance to the nearest open area they could locate for helicopter pickup and that he would be further notified

when this had been done. By this time complete darkness had fallen on the area, preventing any attempt to locate a suitable site from the air. There was no moon.

Approximately 1930 hours Major Crandall was notified that the casualties were ready for pickup. The pickup site was described as a small clearing with tall trees and bushes on three sides and with enemy fire still dominating the area. Crandall elected to attempt the mission with only his aircraft rather than risk additional aircraft under such hazardous conditions.

Taking off with all his helicopter lights out to prevent his being observed by the enemy, Major Crandall flew to the general area. He was completely unfamiliar with the exact area and had to rely on radio instructions from the ground commander. A ground flare was set off in an attempt to guide Crandall to the pickup site, but he was unable to locate it due to the intense mortar and small arms fire.

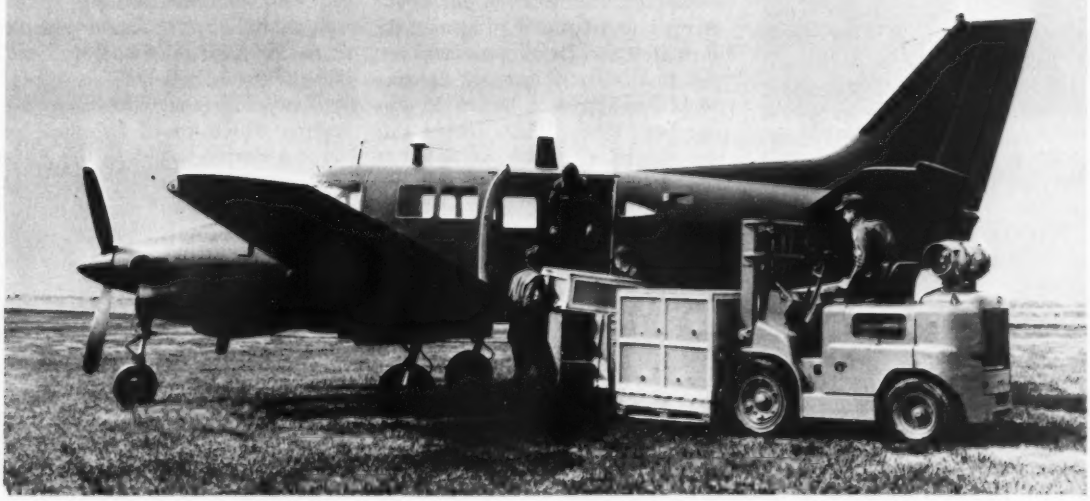
At this point I [LTC Kellar, who was orbiting the area] contacted Major Crandall by radio and told him not to pursue the mission further unless he thought he had a chance of accomplishing it. I made it clear that the decision was strictly his and that it was a purely voluntary mission.

Major Crandall continued to search the area at low level, ignoring the intense fire, until he located a flashlight signaling him into the pickup site where he skillfully maneuvered his helicopter to a landing. Six seriously wounded soldiers were loaded aboard his aircraft. Crandall took off through the enemy fire and flew to a secure area where the casualties were transferred to a waiting helicopter. He returned to the site under the same hazardous conditions and picked up the remaining six seriously wounded men.

Major Crandall's heroic actions were of great inspiration to all those who observed it or monitored the radio transmissions during the period of the evacuation. It was of particular reassurance to the men fighting on the ground to know that if they were wounded they were assured of medical evacuation.

In my opinion the odds against the successful accomplishment of this mission were so overwhelming that no criticism would have been directed against Major Crandall if he had elected to abort the attempt. Major Crandall's superb ability as a helicopter pilot, coupled with his undaunted heroism, culminated in an outstanding humanitarian act.

The U. S. Army took delivery of its first twin-engined, turbine-powered U-21 utility aircraft on 16 May at the Beech Aircraft factory in Wichita. Here troops load the U-21 through its large cargo door which measures 53½ x 51½ inches. (For additional information on the U-21 see DIGEST, June 1967.)



Home of Army Missiles

TO MANY PEOPLE the word "missile" immediately brings to mind America's vast space program. This is an exciting field of research and accomplishment directed by the National Aeronautics and Space Administration, but it is only one phase of the extensive missile and rocket program which is underway at Redstone Arsenal, Ala. The U. S. Army Missile Command (MICOM) at Redstone is currently managing some 20 missile and rocket programs and does specialized work for many government agencies.

MICOM is a major commodity command of the Army Materiel Command. Its Land Combat Commodity Office has responsibility for missile and rocket portions of the Aircraft Weapons Program, and is doing extensive research into helicopter armaments. Armed helicopters are providing our Army commanders with dynamic new dimensions of mobility and firepower on the battlefield. Through the combination of helicopters and armament, the commander is able for the first time to place men and fire in critical areas when needed.

Already an old workhorse in Vietnam is the XM-3 armament subsystem, the result of one of the Army's first funded programs for Research and Development to test the feasibility of arming helicopters. Development began in November 1960. R&D Directorate envisioned a flexible or automatically controlled subsystem. Then in November of 1962 a decision was made to produce on a crash basis a less complex version of the XM-3.

In developing this first system to arm the UH-1B the command was restricted to using as much existing hardware as possible. A large inventory of 2.75" folding fin aerial rockets (FFAR) was on hand, and this rocket was selected for development. It proved to be a wise choice, although some minor design changes were needed. Field reports from veteran aviators initiated a needed improvement in accuracy of fire and a more sensitive fuze system.

Basically, the XM-3 subsystem is an area target weapon. It is a rocket-pod launching system which holds a 48-round complement of 2.75" FFAR, 24 on each side of the helicopter.

Realizing that the improvements which could be made on such a simple system as the XM-3 were limited and that in its present form it would always remain a crude weapon, the Missile Command decided to work on other systems to take advantage of the full potential of the 2.75" rocket. The R&D Directorate considers it still the best thing we have in air-to-ground rockets. A result of this is that while the Army has one system still classified as an experimental system it has other systems already in the field to replace it.

Left: An M-22 wire-guided missile is test fired at a Redstone Arsenal range

Already developed to replace the XM-3 system are the XM-16, XM-21, and XM-158, all of which use the 2.75" FFAR.

The XM-16 is an armament modification kit for the UH-1B helicopter which provides both rocket and machinegun capability. It has two 7.62 mm machineguns and a seven-round 2.75" rocket pod on each side. The XM-21 is similar except that it has two six-barrel Gatling-type machineguns for increased firepower.

Industry developed a seven-tube, 2.75" rocket launcher called the XM-157. However, after reliability and evaluation testing, it was determined that this system would not fully meet the Army's requirements for a reuseable launcher because it was not repairable. After careful assessment of the test results, the R&D Directorate recommended the development of a repairable launcher that would meet the Army's requirements. The result was the development of the XM-158.

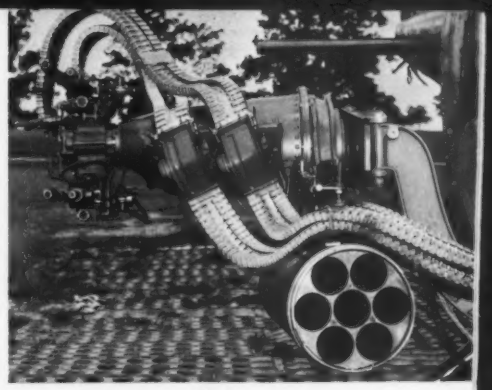
This improved launcher is composed of seven tubes positioned in aluminum castings which are connected to the launcher hardpoints. The XM-158 is in limited production, and first deliveries were made to the Republic of Vietnam early in 1966. Because of its construction, tube assemblies, or parts thereof can be replaced or repaired with ease. Light, inexpensive, and requiring less logistic support, the XM-158 can be used with a variety of other helicopter armaments.

Latest of the 2.75" rocket launchers is the XM-159. It is a reuseable single fire aluminum tube launcher which fires 19 rockets. It is designed to fit the UH-1B, CH-47, AH-1B, and the AH-56A. Although a great deal of work has been done on the system, the Missile Command is still not satisfied with it, but they believe its basic faults can be overcome.

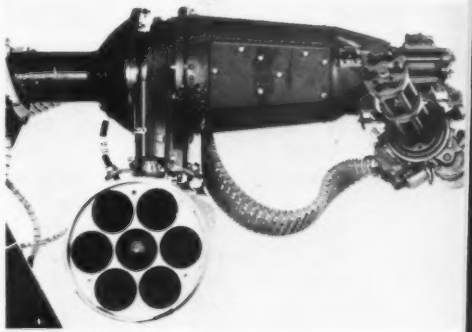
Consistently the 2.75" FFAR has won all cost effectiveness studies that have been conducted. It is on this basis that current and near future aircraft armament programs have been started.

Two variations on the XM-158 pod have been designed and fabricated in an unfunded effort. These increase the number of rockets from 7 rounds to 13. Vertical installation of these can solve the problems of aircraft with limited horizontal space, such as the HueyCobra. Both of these variations exist in prototype and are ready for testing and developmental refinement when approval is given.

The new HueyCobra and the future Advanced Aerial Fire Support System (AAFSS) helicopters



Above: the XM-16



Above: the XM-21

Above: 4.5" rockets on the Huey. Below: the XM-158

The XM-159

are both scheduled to carry multiple pods of 2.75" rocket rounds. The HueyCobra is the first true weapons helicopter, and the AAFSS is to provide a fully integrated aircraft and weapon system.

The HueyCobra has been designed to use a maximum number of UH-1 components and have a significantly higher speed and weapons payload. The AAFSS will be a more stable weapons platform and have greatly improved lift capability. Each of its four weapons pylons are designed to be capable of carrying 2,000 pounds.

Not only has MICOM been active in developing armament systems for Army helicopters, but it has also modified existing ground equipment for use on helicopters. An example of this is the adaptation of the SS-11 antitank missile developed by the French as the M-22 armament subsystem for Army helicopters. The M-22 is a wire-guided, remotely controlled missile for use against surface targets. It consists of a boom assembly on each side of the helicopter which mounts on each boom 3 launchers with missiles.

Although the M-22 system is considered a good system, it will be replaced with the new subsystem which is called the XM-26 and fires the TOW missile. It will be wire guided and optically tracked and tube launched. It will have a stabilized sight system which automatically feeds course corrections to the missile while a computer automatically keeps the missile on the line of sight to the target.

In an even further look ahead, the Missile Command has completed feasibility and comparative accuracy studies of the 4.5" and 2.75" rockets in the indirect (ground-to-ground) fire support role using the UH-1B. The ground-to-ground fire role would allow helicopter to engage targets that were heavily protected by antiaircraft machinegun fire. As a result of these tests, further studies were made for an optimum aerial artillery weapon system. Its primary object was the indirect fire mode, and secondary consideration was for direct fire from the air and direct line-of-sight fire from the ground.

An artist's conception of the XM-26 (TOW) guided missile system

More recently, experimentation has been conducted to demonstrate the feasibility of adapting the standard 4.5" M-32 rocket (modified with a new propellant for longer range) to the UH-1B for both direct and indirect fire modes.

The launcher for this program consists of a cluster of 10 reuseable aluminum alloy tubes, one attached to each side of the UH-1B.

The electrical fire control system consists of a console mounted control panel, bomb rack stepper switches, and the system interconnect wiring harnesses. Two modes of operation are possible: from within the helicopter, and remote up to 150 feet from the helicopter.

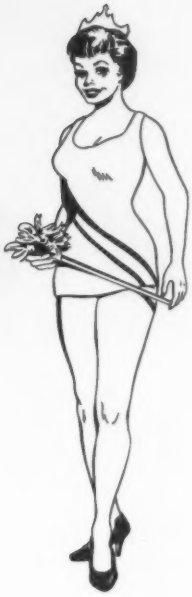
Launcher tests using standard M-32 rockets have made 27 firings from a test stand and 54 firings from a UH-1B on the ground. Excessive launcher movement during these tests resulted in suspension of efforts on the subsystem. A recommendation was made to stabilize the launcher and complete the program. No decision has been reached yet (as of December 66); however, the contracted effort to modify the M-32 rocket is continuing.

These armament systems for helicopters are only a few of the missile and rocket projects managed by the U. S. Army Missile Command. All MICOM projects have a direct bearing on the American soldier. But it is the Aircraft Weapons Program that has placed "armed wings" on his feet—that has changed "airmobility" from a concept to the most basic tactic of battle in the jungles of Vietnam.

QUIZ ANSWERS
(from page 25)

1. CL-41G (Canadair)
2. C-141 (StarLifter)
3. L-4 (Piper Cub)
4. CH-34 (Choctaw)
5. T-42 (Beech Baron)
6. O-1 (Bird Dog)
7. OV-1 (Mohawk)
8. U-1A (Otter)
9. UH-1D (Huey)
10. CH-47A (Chinook)
11. XV-5A (Ryan)
12. AH-1G (Cobra)
13. OH-6A (Cayuse)
14. CH-54A (Flying Crane)
15. MI-10 (Russian Crane)

AAAA AWARDS



Nominations must be in by 1 August 1967

PROPER RECOGNITION of those individuals and units whose tireless efforts give that extra emphasis to our expanding program is most important.

As one means of giving proper recognition to them a broad spectrum of awards are given, taking the form of trophies, plaques, medals, and certificates. Among those are the following which are presented annually at the AAAA National Convention:

AA OF YEAR AWARD. Sponsored by the Army Aviation Association and presented to an Army aviator who has made an outstanding individual achievement in Army aviation during the previous April 1—March 31 period.

AA SOLDIER OF THE YEAR AWARD. Sponsored by Stanley Hiller, Jr., and presented to the enlisted man serving in an Army aviation assignment who has made an outstanding individual contribution to Army aviation during the previous April 1—March 31 period.

OUTSTANDING UNIT AWARD. Sponsored by the Hughes Tool Company — Aircraft Division and presented to the aviation unit that has made an outstanding contribution to or innovation in the employment of Army aviation in furtherance of the Army mission, over and above the normal mission assigned to the unit.

McCLELLAN AWARD. Sponsored by the many friends of Senator John L. McClellan in memory of his son, James H. McClellan, a former Army aviator who was killed in a civilian aviation accident in 1958. This is presented to the person who has made an outstanding individual contribution to Army aviation safety during the previous April 1—March 31 period.

Nominations for these awards may be made by either units or individuals (military or civilian) who desire to see a deserving individual or unit recognized.

Documentation to support nominations should present a brief outline of substantiating facts and include:

For Individual Awards: Name, rank, unit, and duty assignment, address and photograph.

For Unit Awards: Unit name, present assignment or official address and commanding officer or chief's name.

(Documents should be typed but not tabbed since they will be photocopied and limited to 1,500 words or 3 pages, whichever is greater.)

The wide variety of outstanding contributions made to our program by many individuals and units throughout the year will undoubtedly make your choice difficult, but *now* is the time to consider their relative merits and start sending in your nominations. Nominations must be in by 1 August 1967.

Remember, no matter how outstanding or deserving the individual or unit, they won't receive an award and recognition without a nomination!

Send nominations to: Army Aviation Association of America, ATTN: Awards Committee, 1 Crestwood Road, Westport, Conn. 06880.

ARMY AVIATION at the

Eugene C. Paulson

HERE IN SOUTHERN Arizona, where the local altitude record was once a contest between the flight of an Apache arrow and the leap of a frightened settler, Army aviation is faced with a challenging task in support of Research, Development, Test and Evaluation (RDT&E) activities.

The aircraft used to meet this challenge range from the old, reliable "Gooney Bird" to some of the Army's most recent acquisitions. Over the year, the tasks assigned to the local aviation staff have covered a wide variety of missions of increasing size and complexity. The expansion of aviation facilities has kept pace with the continuing growth and development of the Army Electronic Proving Ground.

When Fort Huachuca, Ariz., was designated the United States Army Electronic Proving Ground in 1954, its Army aviation facilities consisted of one 5,000 foot blacktop runway, a small wooden hangar and control tower, an operations tent, and four light aircraft.

The wooden hangar and operations tent have long since been replaced by three large metal hangars, a permanent operations building, and a permanent metal control tower. Five large Butler huts have been erected for use as hangars, shops, warehouses, and flight simulator training classrooms. Two blacktop runways with connecting taxiways, a large parking ramp, and a classified aircraft enclosure are now a part of Libby Army Airfield. Navigational systems, which include a complete ground controlled approach radar system (GCA), terminal omnirange approach (TVOR), and low frequency (LF) radio beacon facilities, have been installed. GCA, TVOR, and automatic direction finder (ADF) instrument approach procedures have been approved by the Federal Aviation Agency. Today, as in 1954, the basic mission remains the same: to provide aviation support for the U. S. Army Electronic Proving Ground (USAEPG).

The Aviation Division, Plans and Operations Directorate, is the primary provider of aviation support for USAEPG, constitutes the aviation staff element for the command, and operates Libby Army Airfield. The U.S. Army Combat Surveillance School/ Training Center and the 52nd Army Security Agency have tenant aviation activities located on Libby Field.

Both organizational and field aircraft maintenance are performed by contract which is supervised by Aircraft Maintenance Division, Logistics Directorate. Avionics Maintenance Division provides avionics maintenance support.

The multitude of test projects supported by the Libby Field air crews during the past 12 years reflects the growing variety and importance of electronic systems in the modern Army. The primary mission of USAEPG is to make certain that those systems meet Army requirements in terms of suitability, reliability, accuracy, and reasonable cost. Whenever the equipment under test involves aircraft, whether as a carrier, a receiver, or a target, Libby Field takes part in the test.

The first such project was an extensive test of the Air Traffic Control and Navigation System (ATCAN), which involved using entire fixed and rotary wing aviation units to evaluate the Field Army ATCAN System.

Subsequent projects have covered such diverse equipment as: electronic flash units for night aerial photography, side-looking airborne radar (SLAR), special sensor experiments, terrain avoidance radar (TAR), communications systems, position fixing systems, altimeters and rate-of-climb indicators, electronic warfare and electronic countermeasures equipment, and distance measuring radar.

Electronic Proving Grounds

A test project may involve one aircraft or several; either fixed wing, rotary wing, or both may be required. The number of flying hours may vary from around 50 to over 2,000.

In some cases an electronic system, such as the SLAR radar, is ready for testing before the aircraft designed to carry the system is available. Such a situation calls for adapting available aircraft to provide the airborne testing platform. It also requires some "nonstandard" piloting.

The weight, speed, altitude, space and electrical power limits of Army aircraft have frequently presented a challenging problem in providing support for tests. Available Army aircraft were sometimes not capable of accommodating the equipment and providing the performance required for testing. The Signal Corps secured six C-47 airplanes from the U. S. Navy in 1958 and modified them to provide airborne electronics laboratories. Two of these C-47 special purpose aircraft were assigned to USAEPG. They are used for tests involving heavy equipment, multielectrical power requirements and numerous test personnel, when standard Army aircraft are not suitable.

One of these C-47 aircraft supported the Low-Frequency Drone Control and Navigation System project for four years, operating at a takeoff gross weight of 31,000 pounds, loaded with test equipment and technicians. The other C-47 was equipped with instrumentation systems and used for two years for electronic airborne checkout of the drone range at Yuma Test Station and the drone range corridor to Fort Huachuca. This aircraft was used as airborne monitor during the SD-5 and other drone flights at Yuma Test Station. Recently this C-47 has also served as the airborne classroom for the U. S. Army Combat Surveillance School/Training Center in teaching operation of SLAR and infrared systems.

In addition to test project support missions, Fort Huachuca aviation accomplishes numerous other essential flight missions to include:

• Transportation of personnel and materiel when commercial or other means of transportation cannot meet the requirement.

• Provide aviation support for forest firefighting, generally helicopters to carry men and equipment to inaccessible regions in the mountains. On one such mission, a number of horses and mules were used and Army helicopters supported them with hay, oats, and water. This is another illustration of the versatility of the helicopter.

• During the big blizzard of November 1958, three Boy Scouts were lost high in the Santa Rita Mountains. USAEPG aircraft conducted the search and ultimately found the Boy Scouts, who had met a tragic fate during the blizzard.

• USAEPG aviation provided support during the disastrous floods of the Eel River in California. Three helicopters were dispatched to the area on 27 December 1965. In weather conditions that ran the gamut from pea-soup fog to driving blizzards and heavy rain, these helicopters completed an average of three rescue missions per day seven days a week, flying from sunup to sunset.

Daring rescues were routinely

Mr. Paulson is employed as a pilot by the Aviation Division at Ft Huachuca, Ariz.

Army Aviation at USAEPG

carried out from floating rooftops, trees, sandbars and any knob of rock that was above water. On one storm-wracked farm they evacuated a family of nine, who had been without food for two days. These daring and highly skilled pilots and crews flew 120 hours and received the thanks of a grateful community.

Aviation support and emergency evacuation from LAAF have become a vital part of life in the surrounding communities at Fort Huachuca.

Glamour, too, had its day at Libby Field when its name was temporarily changed to "Colfax Field" for the movie "Captain Newman, M. D." a few years ago.

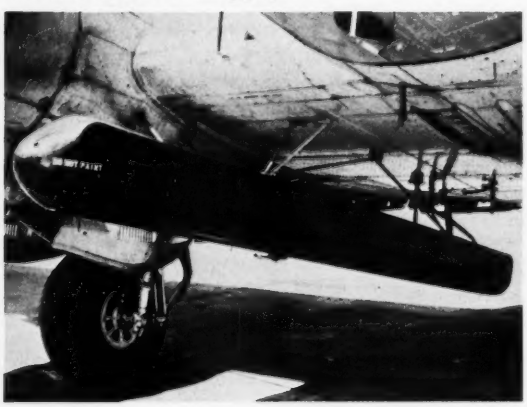
Aviation has had its share of problems, one being the shortage of standard Army aircraft. This problem has been partially alleviated by obtaining the special purpose aircraft previously mentioned. Due to the critical shortage of Army aviators in the past, civilian pilots (civil service) have been hired to alleviate this problem and to lend continuity to the aviation activity at USAEPG. Additional civilian pilot spaces have been allocated to the Aviation Division per the Military/Civilian Substitutability Program.

The task of training aircrews to qualify and maintain proficiency in the wide variety of assigned aircraft is a never-ending effort, dictated by a continuous turnover of personnel. This task is complicated by Libby's location at 4,800 feet above sea level in the foothills of a mountain range. Flying conditions here are less "forgiving" than most places.

In any event, as long as there is a U. S. Army Electronic Proving Ground, Army aviation will undoubtedly be on hand to enhance and expedite accomplishment of the assigned mission.

1. ↑ This RU-9D was used to carry a prototype SLAR system in the early days of testing at Fort Huachuca

2. ↑ At later stages of the SLAR test cycle this RU-8D was used to continue tests



3. ↓ In late 1966, the SLAR and infrared systems were built into a C-47 for training purposes

4. ↓ Here is what all the testing and training was directed toward: the OV-1 equipped with the SLAR system

A Closer Look At Density Altitude

Captain William A. Howard

TO MANY aviators density altitude is something which is periodically mentioned in weather briefings that signifies decreased aircraft performance. While most aviators are aware of this fact, few really appreciate the disastrous effects that high density altitudes can have on aircraft performance unless they have encountered the problem in past experience. Yet year after year density altitude is listed as a contributing factor in numerous aircraft accidents.

While technique is important, the only way an aviator can be completely sure that his aircraft is capable of performing a mission under high gross weight conditions is to consult the performance charts in his operator's handbook or other performance indicators. Often these performance charts, which involve a great deal of research, testing, and money to compile, go unused because of the time and effort required to check them. As a result, many aviators proceed with a potentially critical mission in high density altitude conditions on skill alone. This places the aviator in a precarious position which could result in a costly accident.

A better understanding of exactly how high density altitude seriously impairs the aerodynamic performance of aircraft will hopefully encourage a greater appreciation and use of the operator's handbook in preflight planning.

Density altitude is defined as a theoretical air density which exists under the standard conditions of a given altitude or the altitude in the standard atmosphere corresponding to a particular air density. This definition of density altitude sounds like a big mouthful. To an aviator the important meaning of this definition is that an increase in density altitude denotes a decrease in air density. Air density is the main factor which affects aircraft performance.

Performance of both rotary and fixed wing aircraft are directly related to the density of air. Lift, which an aircraft system is capable of producing, is directly proportional to air density. When a reduction in air density occurs there is a corresponding reduction in available lift. In addition, air density has a strong effect on engine performance. In gas turbine engines, air density affects the performance in the same manner as the airfoil.

The compressor section in a gas turbine engine is nothing more than a series of rotating airfoils designed to increase the pressure and volume of air delivered to the combustion chamber. It can be seen that a decrease in air density will cause a reduction in the efficiency of the compressor section resulting in a decrease of power the engine is capable of producing. If the density of air becomes so thin as to cause airflow separation over the airfoils in the compressor section, a stall occurs. This phenomenon is commonly known as a compressor stall.

Results of decreased air density in a reciprocating engine are the same. A reciprocating engine relies on airflow through the carburetor to sustain the proper fuel-air mixture required to support combustion. As air density is reduced, the air mass flow into the carburetor is reduced, resulting in a loss of power. For this reason reciprocating engines designed for high altitude work are equipped with a supercharger to increase the air mass flow into the carburetor.

The effect of air density on aircraft is two-fold: First, it strongly affects the efficiency of the airfoil or lifting systems. Second, it influences the efficiency of the powerplant.

Air density is affected by these factors: altitude, temperature, and humidity. An increase in any of these factors will cause a decrease in air density or an increase in density altitude. The performance of all aircraft, regardless of design, can be critically impaired by the effects of low air density. To rotary wing aircraft the effects of air density are more vital due to critical loading and varied mission capabilities.

To say that an aviator need only consult his operator's handbook to ensure successful completion of a high gross load mission is foolish. There can be no substitute for sound pilot techniques in marginal gross weight conditions. This combination of skill, coupled with a thorough knowledge of aircraft capabilities and limitations, is what distinguishes the professional aviator.

CPT Howard is with the Training Evaluation Branch, Basic Instrument Flight Division (Contract), Dept of Rotary Wing Training, Ft Rucker, Ala.

crash sense

the following 28 pages prepared by the United States Army Board for Aviation Accident Research

RECONNAISSANCE SENSE

Major Chester Goolrick

THERE IS ONE THING you can count on for sure in this uncertain world. The man who has acquired knowledge but who fails to use it, or uses it improperly, is no better off — in fact, he can be a sight *worse* off — than the poor chap back in the jungle still waiting patiently for somebody to invent the wheel.

You may have the brains of a lab full of Einsteins and enough knowledge to replace the entire faculty, plus coaching staff, of Notre Dame. No matter. If you put the lid on it you might have been better off hanging around pool halls for a living or joining the circus as a water boy for good old Jumbo, the trained elephant.

Any Army aviator is jam-packed near to bursting with specialized and tricky knowledge. Most of the time — nearly all the time — that knowledge is used precisely as it should be. As a rule, you can say the more specialized and tricky the knowledge, the more likely it is to be followed exactly.

There are areas in Army aviation in which knowledge is *not* always being properly used. Here is where headaches and lumps and bruises begin to enter the picture.

Aviation reconnaissance, for instance.

You may well ask what is so blooming tricky about reconnaissance. Everybody learns at the outset about the need for careful reconnaissance, high, low, and ground. Instructors practically brand it on students' chests with hot irons. It is not a subject requiring an advanced degree in calculus. There is not an Army aviator who hasn't been given ample opportunity to appreciate the importance of reconnaissance and sufficient practice to do it properly.

OK, the answer is there isn't anything particularly mysterious about reconnaissance. But as long as you have been asking questions, try answering this one:

If reconnaissance is necessary and basic and everybody knows about it, why do Army aviators occasionally run into wires, drag their rotors on Mrs. Jones' prize rose bushes, or land in places even a halfway look-see would reveal incapable of handling a fair-sized duck?

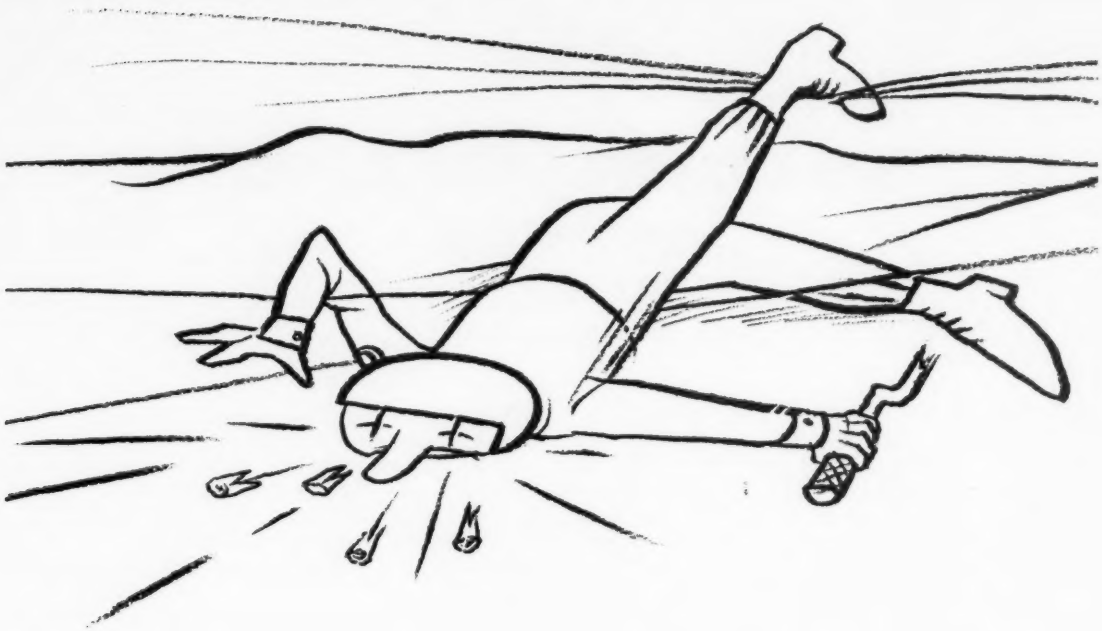
As you have probably already guessed, sometimes reconnaissance either isn't being done at all, or it is being handled improperly. Whatever the case, here is a state of affairs which clearly needs some soul-searching by all concerned.

BET ON IT, BUSTER

There is another thing you can count on for sure. When you start trying to figure why normal, intelligent people sometimes act as if they had the brains of a retarded grasshopper, you will find you've got yourself a can of worms. Ever since Eve broke training and bit into the apple, assorted psychologists have been trying to find the answer to what makes human beings tick. So far, nobody has come up with anything which begins to touch

RECONNAISSANCE SENSE

If reconnaissance is necessary and basic and everybody knows about it, why do Army aviators run into wires...?



all the bases. There is a temptation to say a man is a complex piece of mental machinery governed by complex motives which don't always work properly and to let it go at that.

That is an easy out. It is about as effective a cure for the creeping-reconnitis affecting some aviators as smearing yourself with lard to ward off bubonic plague. The sober truth is that the Army will get rid of accidents caused by poor reconnaissance only when every aviator takes a hard look at what goes into expert, effective reconnaissance and then measures his own procedures to see if they get honor roll marks. Once he is over that hurdle, proper reconnaissance practices in time become a simple matter of doing what comes naturally.

OLD PROS, TOO

One of the ornery things about human nature is that the more familiar an important thing becomes the less important it seems. The care and caution a rookie exercises in the handling of a task can slump off as his proficiency in the job increases, *even though the job is just as important and requires just as much close attention as it always did.*

When you were learning how to fly you did reconnaissance *exactly* the way it was supposed to be handled because (1) you were as green as 30-day bootleg booze, (2) the skies were full of aircraft being tooled uncertainly around by people equally as green, and (3) your IP told you to, and you had definitely been informed it was easier on the nerves to follow his instructions to the letter.

Maybe this is where trouble can get rooted. It may be that some people get hold of a subconscious idea that strict attention to reconnaissance is OK for school but not for the man in the field — that

it is more or less a training device the finished pilot has no need for.

A small amount of reflection is sufficient to show that this kind of thinking has more holes than a paper unbrella in a hailstorm. Experienced aviators haven't more magical powers than the rawest rookies. Fairy godmothers are not handed out with wings at graduation exercises. To know what he is getting into, *everybody* — tenderfoot or the Old Man of the Mountains — has to take a long, hard look ahead, and to look properly he must have a conscious technique which involves planning well in advance.

The planning bit deserves comment. It lies right at the heart of most reconnaissance mishaps. In nearly every case in which a pilot has had an inadequate reconnaissance-caused crash, he can look you squarely in the eye and tell you honestly he thought his reconnaissance had been adequate and thorough — until, that is, the very moment he bumped into something he had failed to see.

Don't start smirking to yourself, either. This is the sort of classic self-deception anybody is capable of all the time. Fred, the faithful accountant who has been with the firm for years, prides himself on letter-perfect bookkeeping. His performance *was* perfect—once. All the time, it has been eroding around the edges because of inattention to details, shortcuts in techniques, forgetfulness, and general sloppiness. It comes as a great shock to Fred one day when he gets a pink slip in the pay envelope because nobody could figure out whether the firm made a profit or ran in the red during the last quarter.

Fred finds out too late how easy it is to fool yourself.

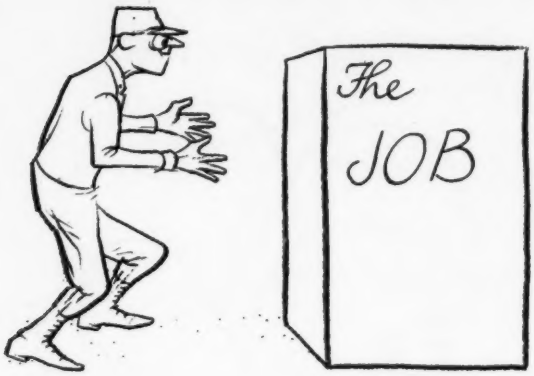
The same goes for reconnaissance-sloppy aviators.

NO RECONNAISSANCE IS WORTH BEANS UNLESS IT IS PLANNED IN ADVANCE AND THE PLAN IS CARRIED OUT TO THE LETTER.

You can't take it for granted, as experienced aviators are well aware. To land in any unfamiliar area without first looking it over with the attention to detail a doctor gives a prize patient is a surefire way of courting trouble. We're not talking entirely about the little men in black pajamas who may be waiting to greet you in a variety of unpleasant ways. You would have to have your head on backwards not to watch out for Charlie in a potentially hostile area. It's easier to forget that spots as peaceful as an old ladies' home can be equally as lethal for anyone who takes things for granted. Places which didn't have wires yesterday — and this goes for maneuvers — can have them

. . . another thing you can count on for sure, normal, intelligent people sometimes act as if they had the brains of a retarded grasshopper . . .

RECONNAISSANCE SENSE

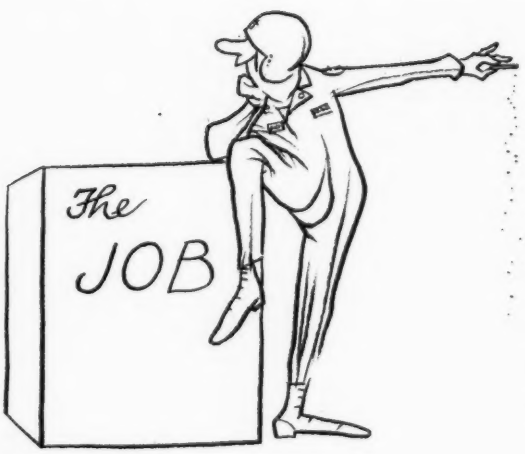


One of the ornery things about human nature is that the more familiar an important thing becomes the less important it seems

before noon today, thanks to the busy people in the Signal Corps. Try relying on old information and you'll wind up by interrupting all communication between headquarters and the 118th Messkit Repair Battalion. Headquarters will not be pleased and will speak to you in harsh terms — provided you are available.

Any pre-reconnaissance information, no matter where, has a way of becoming overripe faster than limburger cheese. A short time ago a helicopter pilot on a cross-country jaunt landed just at dusk on a towerless strip in a small town. He was thoroughly familiar with the strip. You can picture his surprise when he tore off a wheel on an open manhole. What he didn't know was that the strip had been closed down pending repairs, a fact he could have read for himself on a large sign if he had taken a look around before putting down.

We'll agree this is an extreme case, one which shouldn't happen to a dog. Every self-respecting, red-blooded Army pilot has a right not to expect open manholes in the middle of runways. But you'd have no trouble digging up dozens of other, more commonplace, accidents in which the basic *cause* was exactly the same. When a UH-1B hit a tree with its tail rotor, the investigators put their finger squarely on the trouble when they found that neither the crewchief nor the gunner



had been given the specific task of looking to the rear during the hover to takeoff position. "Poor crew coordination," they called it. That's another way of saying lack of recon planning.

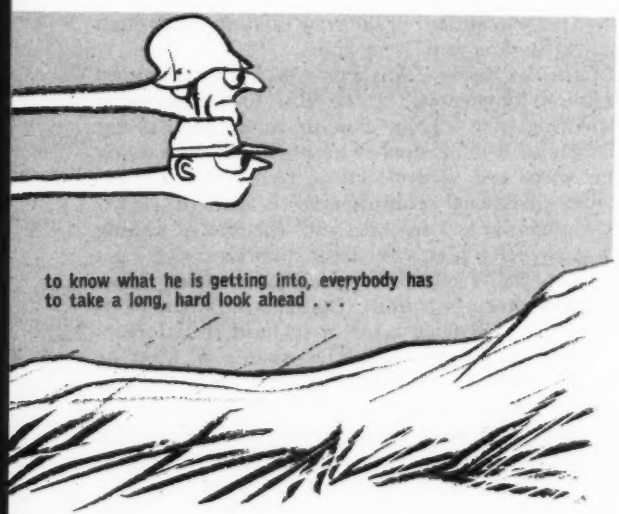
It's a sobering thought that over a particular period exactly 50 percent of all wire strikes occurred during takeoff and landing. There were other circumstances such as power failure or gusty winds. When you subtracted these you still had enough accidents left to lay at the door of faulty reconnaissance to make up a fairly expensive aircraft graveyard.

Nobody has to be rapped over the head with a baseball bat to begin to get the point. Our luckless friend who wound up in the manhole shared several characteristics with a good many other aviators who came to grief because of poor reconnaissance. Not to be too charitable about it, most of them were in the grip of complacency which had doped them into a nice, comfortable false sense of security. Sometimes they relied on out-dated info. They never stopped to think that between last Tuesday and this Thursday, people on the ground could dig holes, fell trees, or throw up wires with the speed and efficiency of a beaver colony working overtime on a dam. They took things for granted, which is another handy-dandy, sure-fire method of sticking your head into the lion's mouth. Count on this, too, friends. You'll get it snapped off every time.

PAUSE THAT REFRESHES

So it is easy to drift into a set of reconnaissance practices sloppier than a hog at lunchtime. But, as every cheery positive thinker will be quick to point out, this is a two-way street with a definitely sunny side. It is every bit as easy to acquire 100 percent correct, all-wool-and-a-yard-wide reconnaissance habits guaranteed to keep a man in one piece no matter how often he has to go to the well.

A fairly simple proposition, it is more a matter of proper attitudes than execution of complicated techniques requiring the amount of training and



the faithful accountant prides himself on letter-perfect bookkeeping . . . his performance was perfect—once

No reconnaissance is worth beans unless it is planned in advance and the plan is carried out to the letter

practice necessary to win the National Open. To become to reconnaissance what Arnold Palmer and Jack Nicklaus are to golf, all you need is

a proper appreciation of how important reconnaissance really is,
a knowledge of basic procedures,
and—most important of all—the resolve to see that you and all in the crew carry them through each time and every time.

Consider the first. Anybody who has been around aviation long enough to be able to distinguish a Bird Dog from a Huey close up on a clear day has a right to feel insulted if accused of not knowing the whys and wherefores of reconnaissance. He *knows* that aerial reconnaissance is a careful survey of a potential landing area with the idea of finding an answer to a pilot's two basic questions: Can I get in? and, Can I get out? He also knows that proper reconnaissance is a must, particularly when he is operating in strange areas or in fluid situations.

He is absolutely right. The trouble is, what he knows won't help him if he buries it under a 6-foot drift of mental snow. He has to keep his knowledge out in front, dusted off and bright and shiny so he can never overlook that a crackerjack reconnaissance isn't a simple affair to be handled in a slapdash, once-over-lightly manner, and that it is every

bit as important as the book says it is.

With his knowledge working for him as actively as a batch of new-made home brew, our reconnaissance-conscious friend is ready for an instant replay of what goes into a top-flight job from start to touchdown.

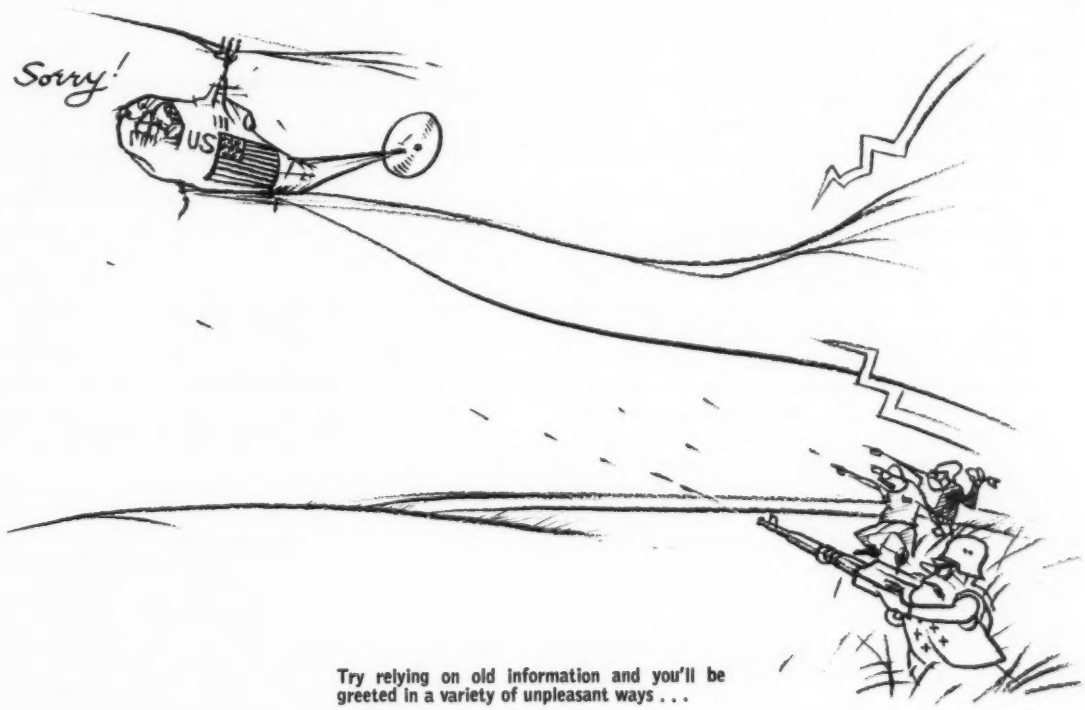
ONE-ARMED PAPER HANGER

It is a good idea to have one idea anchored firmly in mind from the start. The man in the cockpit doing reconnaissance is about as busy as he is ever likely to be in the Army, unless he has been unlucky enough to be put in charge of the New Year's Eve dinner dance at the club. Faulty division of attention can creep through his defenses and get him into a jam deeper than that of a man whose three wives all show up at the same bridge party.

Faulty division of attention is warded off only by full concentration on the task at hand. Concentration, to put it mildly, is likely to be less than effective if an aviator sails into a reconnaissance with the blithe nonchalance of a small boy diving into the ol' swimming hole. That brings us back to the business of planning. Where *does* an effective reconnaissance begin? When the strip heaves in view? When it is two miles away? Three?

Not on your tintype. *Reconnaissance begins at the earliest possible moment.* In most cases, that would be when you are handed your first map of the area showing the location of the strips or pads you'll be using. Thorough familiarity with up-to-date area maps is just as much a part of reconnaissance as a watchful eye for Mrs. McGillicuddy's clothes line. A pilot who knows his map like the lay of his own backyard is in a position to avoid one of the pitfalls which bring on faulty division of attention. If he has studied his map so he has no trouble recognizing ground terrain, he can divide his attention *properly* and keep on flying alertly. If he has trouble telling his strip apart from the Rolling Stones Gravel Company's parking lot — well, you would just as soon not be aboard as a crewman, right?

Once he has evaluated his situation as far ahead as possible, has planned to the full extent his knowledge permits, the alert aviator has an extra padding



Try relying on old information and you'll be greeted in a variety of unpleasant ways . . .

of safety when it comes to actual flying reconnaissance itself. His concentration will not be pulled off base. If he is casual in his evaluation and planning, there is a good chance his recon will be just as sloppy. Mrs. McGillicuddy is due to lose a whole week's wash.

GREEN LIGHT

When the stage of careful planning is over, all you have to do is go through the reconnaissance. Come to think of it, that's somewhat like saying that when you've assembled the ingredients all you have to do is bake the cake. Make a misstep somewhere along the line and you wind up with an iced doorstop.

Cultivation of never-varying standard procedures is the only sure guarantee against reconnaissance cake failures. True, no two reconnaissances are ever exactly the same. Wind, terrain, and emergencies alter situations. Helicopter men have problems different from those facing Bird Dog pilots.

Basic objectives and procedures *never* vary, whether you are piloting fixed wing aircraft, helicopters, or are coming in for landings on broomsticks after a cross-country jaunt on Halloween. You want to know without doubt whether your landing site can handle your aircraft and what obstacles stand in the way of safe landings and take-offs. There is only one way in the world to find out — painstaking and thorough observation.

The first stage — high reconnaissance — is a careful sizing-up process, the kind a college soph gives the blond coed from Gamma Gamma Gamma before inviting her to the prom. He wants to know whether a closer view is advisable or whether he had better forget the whole thing and move down the block to Delta Delta Delta. If he rushes things, or falls down on the evaluating job, he may be in for a long evening when the prom rolls around.

How high is a high recon? High enough to stay well clear of any obstacles, low enough to permit a good general assessment of the landing site's assets and drawbacks. Unless you have eyes like old Chief Bald Eagle, the Indian scout, that usually means between 400 and 600 feet. Go lower and you are verging on stage two — the low recon — before you have finished stage one. Higher and you will be just as well off studying a snapshot of the landing site taken during a Girl Scout camping expedition in 1925.

Sheer altitude isn't all, either. Lateral distance is equally as important, particularly in combat, or

"Poor Crew Coordination"... another way of saying lack of recon planning

simulated combat, conditions. Circle a landing spot like a model airplane on the end of a line and you attract attention of hostiles as surely as if you were squirting striped toothpaste out of the aircraft's tail. A flyby a comfortable distance to one side won't give away your guilty secret. You also avoid a neck twisted like a pretzel.

What do you look for? Just about everything except Easter eggs on the runway. That comes later, during the low recon. During the high-level survey you will make a determination of strip headings, the direction and peculiarities of wind conditions, slope, approach conditions, barriers, a go-around point, and surrounding terrain. Not to be too long-winded about it, *everything you can find out from that altitude which can affect your landing and subsequent takeoff.*

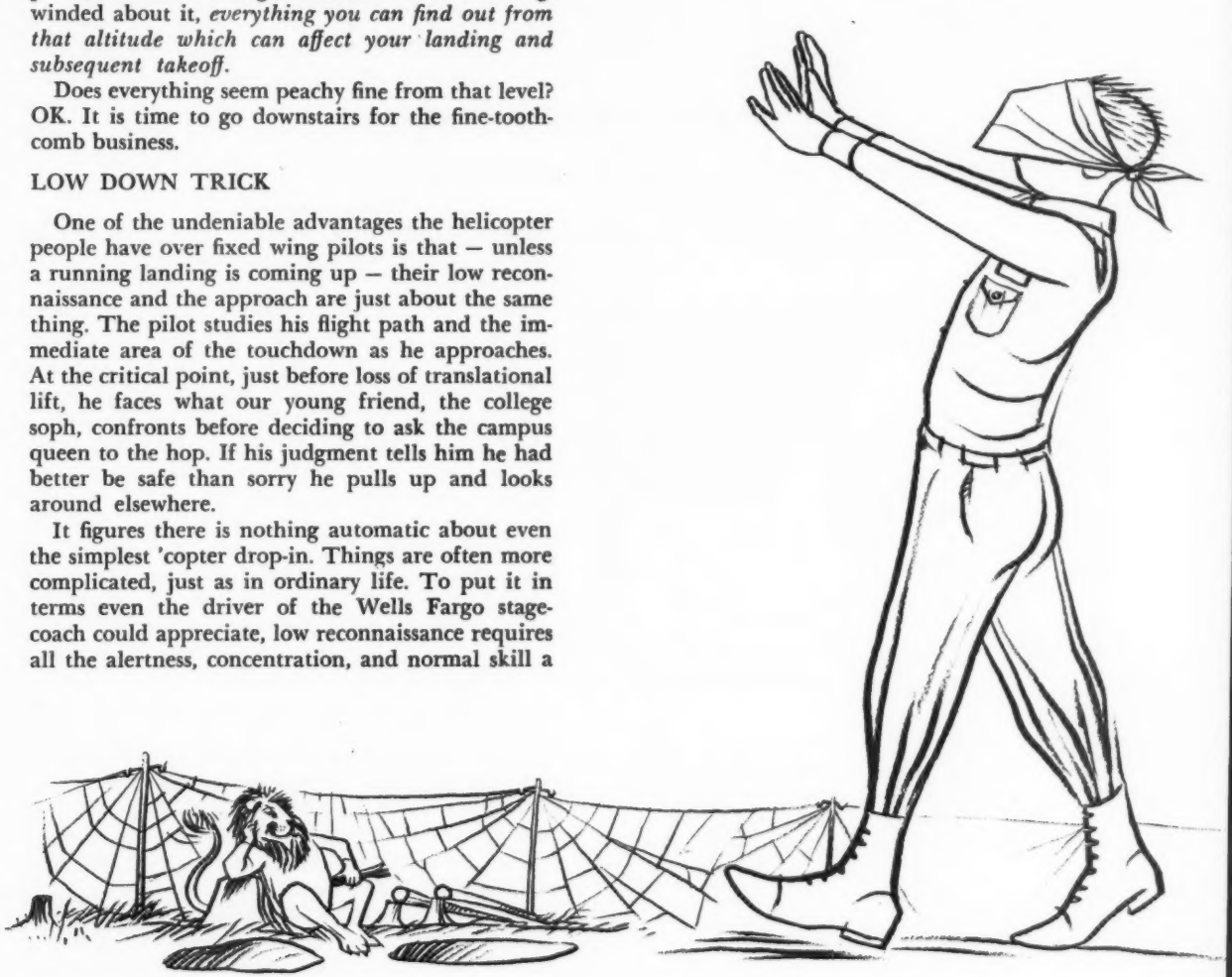
Does everything seem peachy fine from that level? OK. It is time to go downstairs for the fine-tooth-comb business.

LOW DOWN TRICK

One of the undeniable advantages the helicopter people have over fixed wing pilots is that — unless a running landing is coming up — their low reconnaissance and the approach are just about the same thing. The pilot studies his flight path and the immediate area of the touchdown as he approaches. At the critical point, just before loss of translational lift, he faces what our young friend, the college soph, confronts before deciding to ask the campus queen to the hop. If his judgment tells him he had better be safe than sorry he pulls up and looks around elsewhere.

It figures there is nothing automatic about even the simplest 'copter drop-in. Things are often more complicated, just as in ordinary life. To put it in terms even the driver of the Wells Fargo stagecoach could appreciate, low reconnaissance requires all the alertness, concentration, and normal skill a

Taking things for granted is another sure-fire method of sticking your head into the lion's mouth . . .



RECONNAISSANCE SENSE

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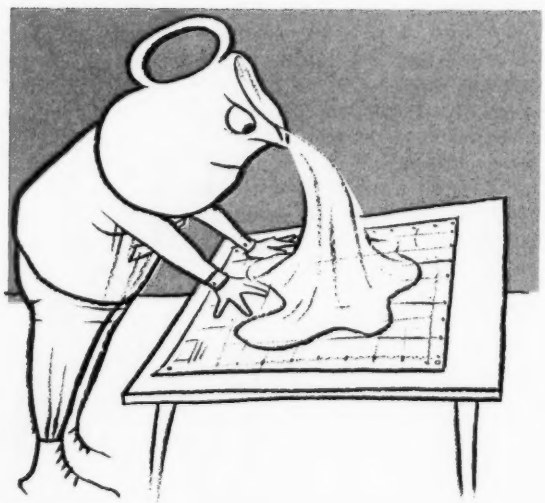

Reconnaissance begins by pouring over your first maps . . .

man has at hand, no matter what he is chauffeuring. Here is a time when the margin of safety must be deliberately shaved to the thinnest margin ordinary common sense demands. It is no place for a man who has allowed his attention the day off to go gathering nuts in May, or who has not done his planning homework properly.

As everybody knows, low reconnaissance is made to afford an aviator a nearer look at what he has observed from on high, the way the camera zooms in for a close-up on the heroine just before the fade-out. If we all shared old Chief Bald Eagle's eyesight, we too could zoom in for a landing, happy in the thought the ending would be happy. As it is, transitions for helicopter landings and fixed wings descending from high to low must be done with the caution of an old maid inspecting the premises for burglars before locking up for the night. Gradual is the word, the objective being to spot any TV towers, smokestacks, sand dunes, or flagpole sitters and then to establish a margin of 40 to 60 feet to keep out of harm's way.

Once he has his altitude fixed, the pilot heads into the wind as a prudent precaution against a forced landing, maintains sufficient airspeed to keep

altitude, and begins his flyby at a point about 300 feet from the end of the strip or area.

And:

. . . But Not Forgotten
Shed A Mournful Tear For Our Pal Who's Gone.
He Glanced Down In The Cockpit During Recon.

A dedicated pilot during low reconnaissance is more interested in scenery around him than a girl-watcher on the set of a James Bond movie. If his planning has been so inadequate he must consult his airspeed indicator, his goose can be stuffed, cooked, and served up on a platter with parsley in less than the time it takes him to get his attention focused back where it belongs. During low reconnaissance, a pilot maintains his airspeed by attitude and feel, while making a thorough evaluation of conditions about him. Given reasonably smooth air, this means a fixed wing pilot will be using the flap setting and speed called for by his type of aircraft in normal slow flight. The helicopter pilot planning a running landing keeps his airspeed adequate to maintain translational lift, at a sufficient altitude to clear all obstacles. In either case, he is free of worrisome odds and ends which can clutter his mind like junk in an old attic.

Low reconnaissance exists in the overall scheme of things solely as a means of (a) uncovering pitfalls which can't be detected from higher up and (b) enabling a pilot to plan his approach if the landing site doesn't appear to have more unsolvable problems than a dropout from Analytical Geometry 201. At 600 feet, for instance, nobody, not even Bald Eagle, can see wires. About the best you can

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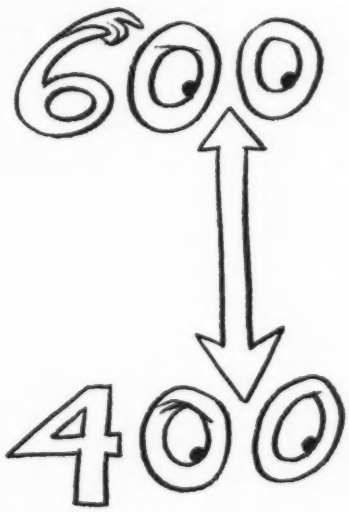


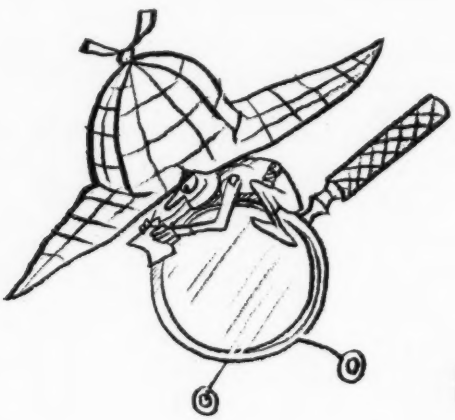
A high recon usually means between 400 and 600 feet

do is look for evidence, such as poles and towers. This isn't enough by itself, as some luckless souls have found out seconds before they blacked out a tri-county area. In some places wires run from house to house rather than from pole to pole, and in combat or on maneuvers, the Signal Corps people will string them between giraffes if nothing else is handy. Down low is where you spot the wires themselves.

The same goes for wind. From a safe distance aloft you can usually make a reasonable estimate of conditions from such signs as waving branches, smoke trails, and the like. Low reconnaissance enables you to make an accurate judgment as to what to expect when you get to the stage that really counts, the approach.

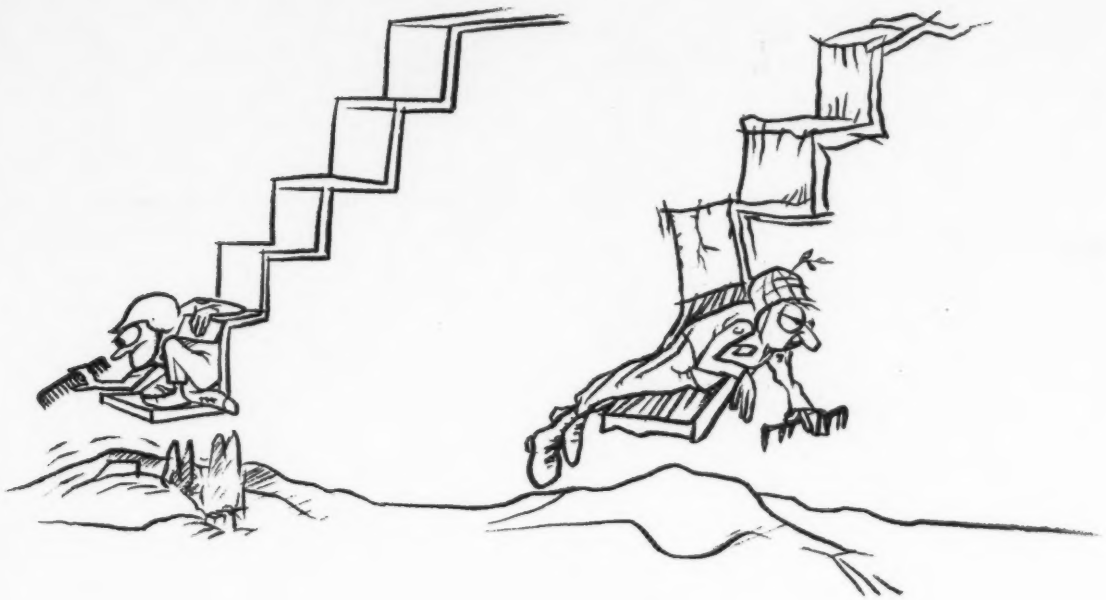
If you are satisfied there are no hazards which can't be handled with a reasonable margin of safety, you can go ahead with planning the approach by giving the strip an end-to-end scanning for cows, tree stumps, pot holes, and picnic parties which could get in the way of the rollout. But keep this pasted in your memory book, chums. *You never go in for the approach until you are completely satisfied you can get in and out again without taking an undue risk.*

If you have even a tingling in your scalp that warns you something might be rottener than a barrel of ancient herring in Denmark, apply power and gain a safe altitude to think things over. Keep this in mind, too. They keep adding laws to the books every day. So far, nobody has written one making it a prison offense to make more than one low reconnaissance per mission. Time consuming? Tedious? Sure. But you get where you are supposed to be in one piece, which is the name of the game.



Find out everything that will affect your landing and subsequent takeoff

reconnaissance requires all the alertness, concentration, and skill a man has at hand . . .



WORM'S EYE VIEW

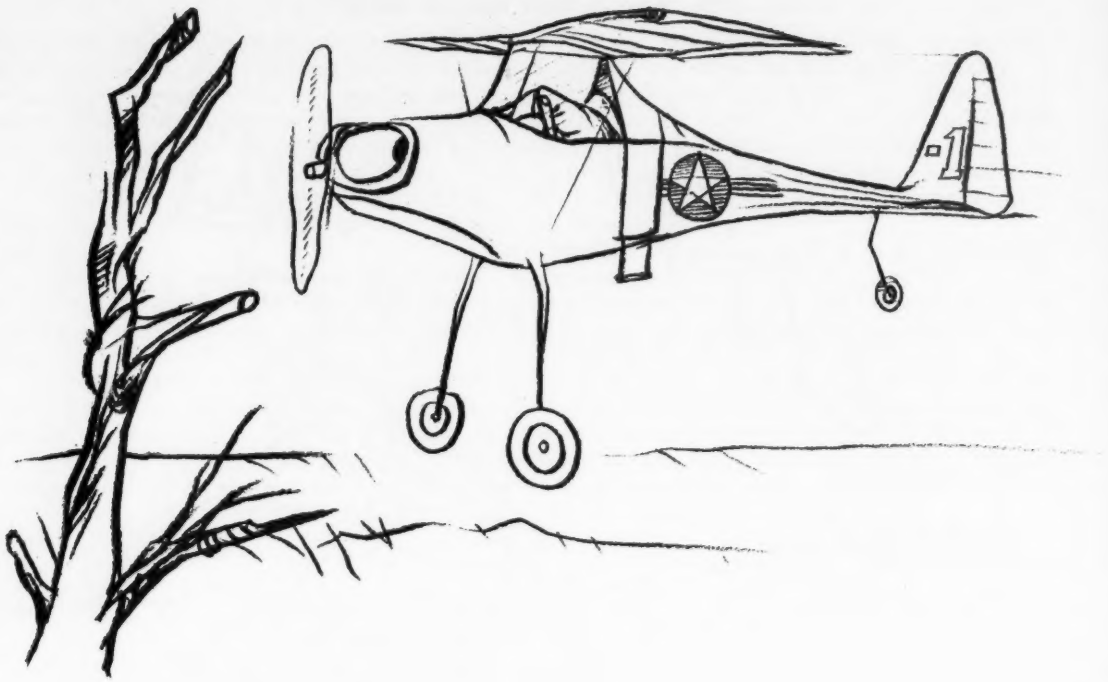
Not everybody has to make a ground reconnaissance every time he is in a strange area. You would look a little foolish after your first flight into Atlanta standing out in the middle of runway nine trying to decide whether the field could be camouflaged and how it could best be defended against enemy attack.

But somebody always has to be the first to visit a place, like Robinson Crusoe, or Admiral Peary. When you are the lucky lad taking a turn as trailblazer for an aviation unit in combat or on maneuvers, you can do everybody a good turn by making a ground reconnaissance *which will help the planning of the pilots due in later.* If Crusoe had kept his trap shut about conditions on his island, people taking winter cruises to the Caribbean today would be carrying along fur coats.

If you are on the ground, hale and healthy and

Transition for helicopter running landings and fixed wings descending from high to low must be done with the caution of an old maid inspecting the premises for burglars

RECONNAISSANCE SENSE



During low reconnaissance, if you must check your airspeed indicator, your goose can be cooked in less than the time it takes to get your attention focused back where it belongs

your nerves as calm as a day in May, chances are your aerial recon was well-planned and thorough. But if you are the Crusoe of this particular strip, you might uncover conditions, not observable from the air, which could alter your takeoff plans. Or the wind might change without giving two weeks notice in advance. Aside from that, you can determine accurately whether the surface is better for building sand castles or making mudpies, check its drainage against a possible rain, and measure the dimensions of the strip, the height of barriers, and their distances from the strip's ends.

You may not succeed in turning it into a home away from home on the basis of one flight in and one flight out. But you can be certain the rest of the unit will rank you one jump ahead of Old Dog Tray as a faithful servant of mankind.

SOP, DOUBLED IN SPADES

Take the time sometime to run through a summary of accidents stemming from faulty reconnaissance. The phrase "failure to follow SOP" for such things as altitude, airspeed, and transition

from high to low keeps jumping out at you like clay pigeons from a trap. Accident summaries make pretty cheerless fodder, not the kind of thing you would want to read to Junior before bedtime or have set to rock and roll music.

They will impress one hard fact on a thoughtful man:

WHAT GOES FOR STANDARD PROCEDURES IN ANY PHASE OF ARMY AVIATION GOES DOUBLE FOR RECONNAISSANCE

There is too much at stake, too much which can get in the way, for anyone to overlook reconnaissance as a danger area and fail to act accordingly. Everybody aboard an Army aircraft in a responsible position has his part to play, and when the planning has been done, he knows how to do the job as smoothly as a crewmember of a team fueling an Indianapolis racer during a pit stop. In the long run, though, the man at the controls is the one who makes the decision. Confronted with the task of keeping an eye open for other aircraft likely to be infesting the area, obstacles on the ground, wind conditions, and the suitability of the strip—and all the while handling his aircraft with about as much running room as a quarterback trapped in the backfield by the Packers' defense—he needs every bit of the wit, skill, and concentration he has at his command.

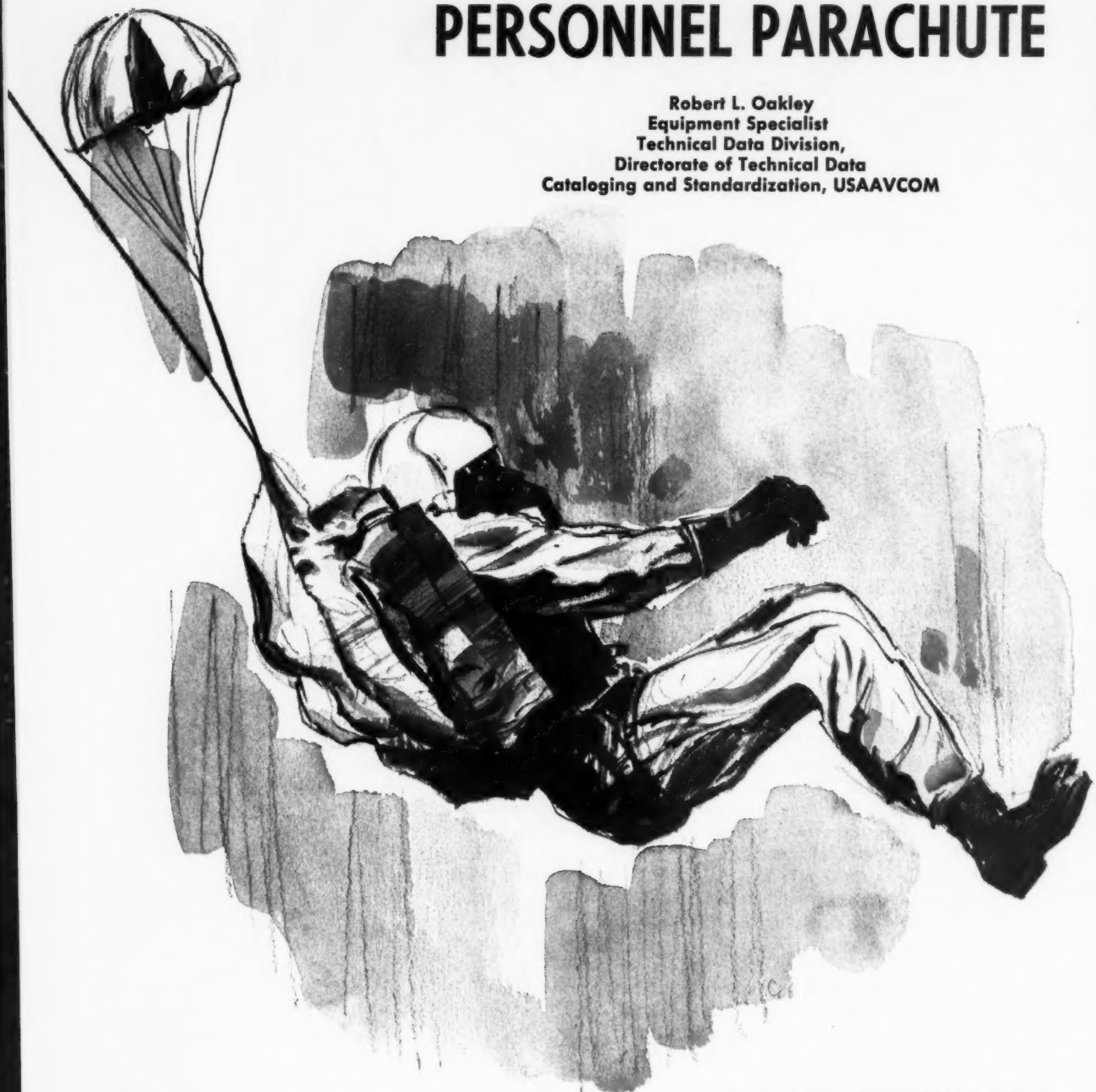
He will find at the last critical moment that all three have gone temporarily AWOL unless his reconnaissance SOP includes a hefty dosage of conscious planning to ensure a performance as slick as a pen full of greased pigs. Men who wait to the last minute to do their Christmas shopping and arrive home with a stuffed pelican for their wives are due for a chilly reception when the presents are opened. Pilots who do their reconnaissance shopping at the last moment won't receive the kind of hospitality from the strip for which the Old South was justly famous in Robert E. Lee's day.

You can sum it up in one handy saying:

STAY ON TOP OF PROPER RECONNAISSANCE PRACTICES. THEY WILL NEVER LET YOU DOWN—THE HARD WAY.

OPERATING INSTRUCTIONS, OV-1 PERSONNEL PARACHUTE

Robert L. Oakley
Equipment Specialist
Technical Data Division,
Directorate of Technical Data
Cataloging and Standardization, USAAVCOM



. . . the Martin-Baker ejection seat is used by other services throughout the world and has saved more than 1,000 lives . . .

YOUR PARACHUTE is a vehicle. Like other vehicles, it demands that you possess skill and knowledge to use it. Since your first use of a parachute will most likely not be for practice, you must know how to use it *before circumstances require you to eject.* Rules for using your parachute are simple and skill comes naturally if you know precisely what to do.

Details about emergency ejection procedures are presented in TM 55-1510-204-10. This article is concerned primarily with your actions after you have separated from your seat and the parachute has opened.

The Martin-Baker ejection seat, such as the ones installed in the OV-1, is used by other services throughout the world and has saved more than 1,000 lives. Its satisfactory operation can depend on you. You should know, in deciding to eject or not to eject, the following general information about emergency escape:

During an emergency in the air, it is natural to feel that staying with the airplane, if possible, is safer than ejecting. The airplane is substantial. It feels safer, is familiar, and represents something solid to hold to. Don't let this feeling fool you. It's dangerous!

If there are any doubts about getting the aircraft down safely, EJECT! Your ejection seat and parachute were provided solely to put you safely on the ground when your airplane can't. It is there to be used.

Most emergency escape fatalities are caused by ejecting outside the operational envelope of the ejection seat, in altitude, attitude, or airspeed. This often comes from hesitation and indecision. Make your decision to stay with the aircraft or to eject while you're in the operational envelope of the seat.

Your Martin-Baker ejection seat parachute has been packed and serviced by a trained technician. Its harness is made of high strength nylon webbing. This strength can be materially reduced if the harness is not properly maintained. Here are some tips to help ensure that you will always have a full strength harness.

When not in use, see that your harness is stored in a dry place, out of sunlight.

Do not leave your harness in the cockpit, hanging from the airplane empennage, or lying on the ramp or ground between flights.

Check the harness daily for oil, grease, hydraulic fluid, or other contaminants. Keep it clean.

Should you find loose stitching, frayed webbing, or rusty hardware, see that repairs are made before your next flight or get a new harness.

The parachute harness is basically a sling, like a child's swing, with other straps added to keep you from falling out of the sling. These straps may all be adjusted to obtain proper harness fit.

A common method used to adjust harness size is to loosen or tighten the leg straps and chest strap. This will not always provide a proper harness fit. New harnesses have adjustment instructions printed inside the harness vest. In case your harness has no instructions for donning and adjustment, follow these steps:

With the harness laid out before you, loosen all straps.

Put the harness on.

Fasten leg and chest straps.

Tighten chest strap and sit down.

Tighten the side sling adjustment straps (in the bottom of the fitting where you connect your parachute risers), so that the metal adjustment fitting is just below your collarbone. If your harness straps have sizing numbers, note the adjustment number nearest the fitting. This is your harness sling size. It can be used for future adjustments if you change harnesses. The left and right adjustments of the sling should always be the same.

Tighten leg straps and stand up.

Tighten the back straps, just below your armpits, until the harness fits snugly in all areas. Now, when you sit down, your harness will feel comfortable.

If you feel a good bit of slack material in the back of your harness vest (put there to accommodate heavy flight clothing), take the harness off and tighten the horizontal back strap. The new harness has two adjustable fittings on this strap. The older harness has only one.

Stow the loose ends of your harness by folding the webbing under and sliding the elastic keeper over the fold for retention.

Now you are ready to mount up. The only attachment of your parachute to you is through the harness fittings located just below the collarbone

near each shoulder. Before you connect the canopy releases (sometimes called rocket jet fittings) of the parachute risers to your harness:

Make sure that the two halves of the roller yoke shackle are snapped together. This is the fitting through which your seat inertia reel loop strap is threaded. Snapping the two-piece fitting together with the spring clips will keep the protruding clips from damaging the loop strap and will keep the shackle straps from flailing about during the emergency ejection seat separation sequence.

Look at the parachute ripcord handle stowed in its retaining clip on your left parachute riser. Make sure that the cable connected to the ripcord goes straight into the ripcord housing. If it is bent about 90° to the right, crosses the riser above the handle retainer, and then makes another sharp bend before going into the ripcord housing, the HANDLE IS INSTALLED BACKWARDS. In this case, call your seat mechanic. He can remove the handle from the retainer, reverse it, install the handle correctly, and then check the ripcord pins to see that the pack is still securely closed.

WARNING – DO NOT DEPEND ON SOUND TO INDICATE THE PARACHUTE RISER FITTINGS ARE LOCKED ONTO THE HARNESS. When you board your airplane and strap up for flight, your crewchief probably connects your parachute risers to the harness for you. Locking of the canopy release fitting is usually heard as a "snap." THIS SOUND DOES NOT ALWAYS INDICATE THAT THE RISER FITTING IS LOCKED. The locking slide, which moves over the top bar of the harness fitting when hooking up the parachute, should be checked to see that it is positively locked. To do this, attempt to unlock the release by moving the slide bar upward without depressing the push buttons. After this test, push the slide firmly back down and you're in business.

After you separate from the seat, you will feel the surge of the parachute opening shock. Sometimes during opening your body will rotate enough to put a few twists in the risers and suspension lines. If this happens, relax. The twists will unwind.

If time permits, look about to observe the descent of your airplane. You may wish to make your way to it if it is within a reasonable distance. A wrecked airplane is conspicuous from the air and will yield useful emergency equipment, as well as aid in your rescue.

If your airplane was equipped with the seat pan survival kit, it will be hanging below your buttocks. You should be sure the survival kit container retention strap, which is part of your lap belt, is securely snapped in the hole on the bottom of the left lap belt support strap, then open your lap belt latch. The survival kit will drop down and swing across to your left side. WARNING – LANDING WITH THE SEAT SURVIVAL KIT SUSPENDED UNDER YOUR BUTTOCKS AND BEHIND YOUR KNEES IS HAZARDOUS IF YOU DESCEND ONTO LAND.

On any emergency escape where you may land in water, landing with your life preserver inflated is best. If you eject over an area where large bodies of water are present, or if it is night time and you are wearing your life preserver, inflate it as soon as your survival kit is dropped down to your side. To do this, pull down sharply on the two lanyards which hang from the bottom of your preserver. Note: If you are wearing the old type B-5 preserver (mae west), inflating it under your parachute harness will not hurt you.

As you probably will be wearing the LPU-2/P underarm type preserver, you should connect the front of the two inflated bladders if time permits. Your preserver has the hook and pile tape to provide for this. Now your preserver bladders will not be pulled behind you when you hit water.

Prepare for your landing. A successful emergency escape is not completed until a safe parachute landing is made. One easy rule to remember will permit you to make a safe landing under most conditions–RELAX AND LAND LIMP.

Proper body position can make your landing easier and safer. On ground landings, your feet should be together, knees slightly bent so that your toes point down a little, and your arms should be raised, hands on the parachute risers. To make your "limp landing," which is most important on land, look steadily out at the horizon–DO NOT LOOK DOWN!

If it is windy, bear in mind that the same fittings you used to connect your harness to your parachute risers will allow you to spill your parachute canopy. On windy days, be ready to use them as soon as you touch down, whether on the ground or in water. WARNING – DO NOT USE PARACHUTE RELEASE FITTINGS UNTIL YOU HAVE TOUCHED DOWN.

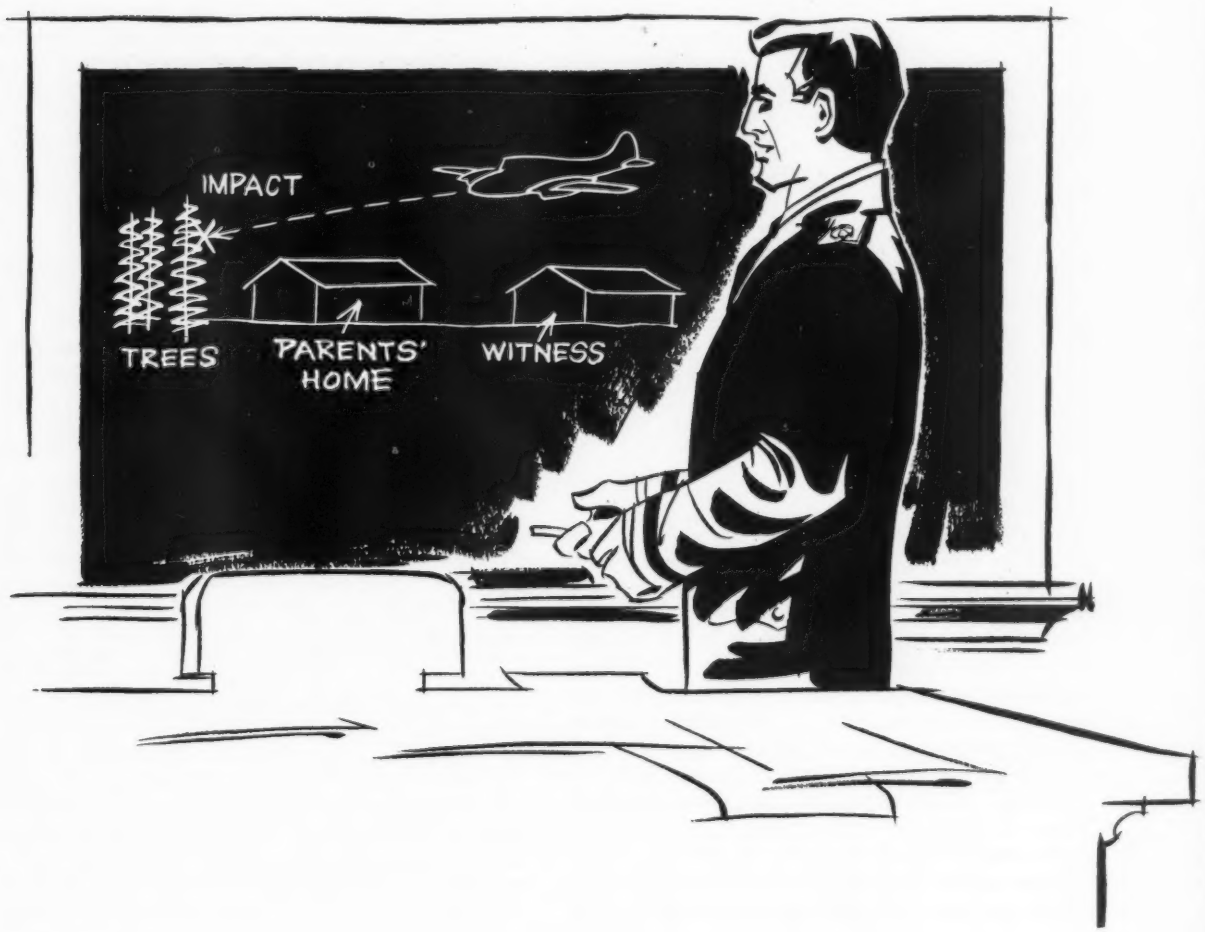
If conditions permit, you should recover your parachute and turn it in to your supply unit. More important, your parachute has many survival uses and may help to save your life or obtain rescue aid. A booklet on the survival uses of the parachute will be found in a pocket of your parachute harness or in your survival kit. USE IT!

ILLEGAL-IRRESPONSIBLE-FATAL

There was no indication of mechanical failure . . . the pilot violated regulations . . .

THIS IS THE account of an aviator who, while carrying an unauthorized passenger (his brother), crashed while attempting to buzz his parents' home. Both occupants were killed and the aircraft was destroyed.

Background— Copilot on previous flight: " . . . We filed an IFR flight plan to our destination. . . . About 40 miles out it was overcast. I remember contacting approach control and they asked what kind of approach we wanted. We asked for an ILS to runway 9 right. They gave us a radar vector to the ILS and we started getting moderate turbulence at about 4,000 feet. We got our final vector to 09 and when we arrived over the outer marker, everything was still going fine. We were at our proper altitude. I made the radio call to report outer marker and he let down the landing gear, reduced power, and cracked the flaps. . . . It was rough, real rough.



ILLEGAL-IRRESPONSIBLE-FATAL

". . . I was scared, so were the two passengers, but it didn't seem to bother the pilot . . ."

"He was flying the aircraft. The needles were going to the right, meaning we were left of course and the glide slope needles were going down and our airspeed was dropping. . . . It was 90, then it was 80. So I got on the horn and I said, 'Add power and lower your nose.' I didn't hear him acknowledge so I rechecked the airspeed and it was critical, 62 knots, 60 knots.

"I looked at him and hollered, 'I've got it!' and he said, 'Roger, you have it.' I thought to myself that he gave that up awful easy. He gave it full throttle before I took it and I noted the props were not full forward so the first thing I did was move the props full forward. I reached down, raised the gear and flaps, put both hands on the wheel, and looked at the attitude indicator. I pushed the nose down and one of the passengers in the back seat said, 'Good, your airspeed is coming up. It is 80.'

"I got on the horn and asked approach control if I could have another radar vector to ILS 9 right. I came around, brought it down, and landed. There are a couple of things about this flight that were kind of funny. The first thing that I thought was that he gave the aircraft up awfully easy, like he wanted to get rid of it. The second thing was that when we got back to the ground, I was scared. I was shaking and very happy to be back on the ground. So were our two passengers. . . . But it didn't seem to bother the pilot. Maybe he just didn't show it; but it didn't seem to bother him. . . ."

Question: "How long before the accident was this flight?"

Answer: "Ten days or two weeks."

Airport manager: "I was on duty at the airport at about 1000 hours that day when a U. S. Army twin engine aircraft landed. The pilot told me that he would need gas before he made his return trip. After he was on the ground for about 15 minutes, he took someone up in the aircraft for a ride. He flew around the local area, making dips and turns. . . . He made several other flights around the local area with different people. . . . On one flight, he was about 600 feet from the runway and made a sharp left bank over the hangar. . . . A man in a station wagon came to the airport and he got into the Army plane with the pilot. They took off. . . ."

Question: "In your opinion, did you feel that the pilot showed good judgment in his flying?"

Answer: "I think that he did not have too much training in the aircraft he was flying, and that he was showing off."

Question: "Did you know any of the individuals who were given rides in the Army plane?"

Answer: "No, but I did hear that the man in the station wagon was the pilot's brother."

Witness: "My wife, daughter, and I were watching TV and we heard this plane come over real low. We went outside and looked to see what was going on. The plane circled and came back over the vicinity, making three or four passes over this general area. The last time it came over, it came from the south, directly over my home, and it seemed to go down steadily and strike some trees. It fell and exploded. . . ."

Question: "What kind of a dive was the plane in?"

Answer: "It seemed like a steady dive, slow, like an approach to a landing."

Question: "On the other passes, as he went around, what kind of a turn was he making, right or left?"

Answer: "He made turns to the left."

Question: "This flight path placed him over your home and over the home of his parents?"

Answer: "Yes."

Aircraft accident investigation board findings:

"There was no indication of mechanical failure of any aircraft components.

"The pilot violated regulations by transporting an unauthorized person aboard an Army aircraft; by operating the aircraft in a careless and reckless manner; and by operating the aircraft below prescribed minimum flight altitudes.

"The attempted recovery from the final dive was initiated with insufficient altitude remaining for recovery.

"The pilot most probably channelized his attention on the house he was buzzing and, as a result, failed to properly control the aircraft."

Flight surgeon: "Aviators should be reminded that their skills and functions as aviators are not merely technical, but that they also have professional obligations as members of the military to exercise good judgment and flight procedures at all times."

ACCIDENT NO. 2

Two Army aviators, not on active duty, were attempting to return to their home station after a visit with friends.

Flight service station: "Traffic control center, this is flight service station. We just had a couple of guys take off in a light single engine. Can you pick them up on your radar yet?"

Traffic control center: "I don't see anybody in your vicinity."

Service station: "They're probably not up high enough yet. I just wondered if you'd kind of watch them. Both of them were pretty well under the weather."

Control center: "OK, I'll look out for something. . . . Did he file airways?"

Service station: "He filed direct."

Control center: "Well, I don't know whether it's them or not, but I have one about six miles south of ——— intersection, southbound."

Service station: "He may go on the airway, I don't know, but he's going in the wrong direction if he was over ——— intersection."

Control center: "I have this target south of the intersection southbound. I don't know whether it's them or not, but it's the one I picked up in your vicinity."

Service station: "He filed for 5,500 feet. Maybe he just hasn't made his turn yet. He might be planning on going airways, but he filed direct."

Control center: "This one I picked up was southeast bound, then he made a turn, headed west, and picked up the airway south out of your area. He's still southbound so it might not be him."

Service station: "They were off at 54 and should be way south of the intersection by now."

Control center: "What's his ground speed?"

Service station: "He filed 140 knots and ——— intersection is only 20 miles from where he took off."

Control center: "The target I picked up was headed southeast, then it went about 12 or 15 miles southeast of your area, and then turned and went westbound."

Service station: "Well, that must be it."

Witness: "I first heard the plane when it circled over my house around 0400. I had just gotten off work. The plane engine was sputtering the last time it circled over the house. Earlier, it had circled over the house and the airfield. I then dozed off and my wife awoke me and said she thought the plane had crashed. The sheriff came to get me at 0600 to stand guard over the crash."

Witness: "I woke up about 0430 and heard an airplane. I looked out the window and saw it going south with blinking lights on. I thought it was going to land when it left, but the plane came back and turned just south of my house and made a slanting turn, losing altitude. A few minutes later, I heard a loud sound like a big tree falling. I sent my sons to investigate. . . ."

Witness: "My mother woke me up and told me a plane had crashed. I ran down immediately. The door was open and one pilot was leaning out of his window, with a gash on his head. Both pilots were strapped in their seats. While someone else administered first aid, I came back to the house and called the ambulance. It came immediately and I directed it to the crash scene."

The airplane was destroyed and the pilot killed. The copilot sustained serious injuries.

Accident investigation board: " . . . The fuel indicator was on the right tank, which agrees with the copilot's statement of switching to the right tank, the last full tank. The hour meter in the aircraft indicated a total flying time of 4.7 hours at the time of the crash. On this model, this would be the maximum. For planning, 4.5 hours is considered the maximum. Visual inspection at the scene verified no usable fuel in right, left, or auxiliary tanks. . . .

" . . . The pilot was under the influence of alcohol, which is the only explanation for his erratic flight. . . . By statements from the copilot and reports from radio transmission records, the board analyzed the flight as follows: Takeoff was made at 0154, with the aircraft following a direct course for about 10 nautical miles. It then turned southwest for about 15 nautical miles, turned south past ——— intersection, passed another intersection on the airway, then turned southeast for about 12 nautical miles where radar contact was lost, probably due to distance and altitude. It was at about this time that the copilot said they could not make radio contact. He said they could see no lights and they should have been in sight of a town. At 0337, the pilot reported over the town, but the copilot stated they did not see the town and that the pilot told him he was sure they were over another location. The copilot stated the auxiliary tank went out and the pilot switched to the right tank, which was full, and said they would have no problem making their destination. They were actually over the town, not where the pilot thought they were, which is a difference of 77 nautical miles.

"The copilot stated that after flying for some time they could see a large town in the distance and that the right fuel tank was very low. They then decided to try for an unlighted field, which

they were familiar with and felt they could make with their remaining fuel. The aircraft crashed one-quarter mile short of the airfield after the fuel was exhausted."

Question: "I understand you went out to visit your friends and had a barbecue with them and had some drinks. Is that correct?"

Copilot: "Right, we had a couple of drinks then, and then later on that night we barbecued and had several big steaks. It was around 2230 when we finally got around to eating the steaks."

Question: "What did you do after that?"

Copilot: " . . . We just sat around and talked . . . and it was getting sort of late and our host had to get up early the next morning, so we decided we would come on back. . . . They wanted us to stay all night, but I had some other business that I wanted to take care of and I felt that we should come on back that night. . . . "

Question: "What was the importance of your being back the next morning?"

Copilot: "Well, I wanted to make up one of the drills I had missed . . . to go in on this pay report."

Question: "Would you give us the plot of the flight plan, what you did, and so forth?"

Copilot: "Our host took us back to the airport. The pilot went on and filed the flight plan and we stood around out in the lobby, talking. . . . Then we went out to preflight the plane and the pilot and I went over the flight plan route that we were going to take back. . . . I set the omni and everything up for the pilot and I noticed he was messing with the DG. I assumed that he was setting the compass at that time and we took off. After we were on course and the needle was centered, I told the pilot, 'Now you are on course, and in a few minutes we'll switch over to the next station.' The needle was centered at that point, so that all we would have to do is fly with the heading and we would end up in the right place."

Question: "Do you remember what heading you put your omni on?"

Copilot: "I don't remember exactly. All I know is that it was a southeast heading, less than 180°, if I remember correctly. After a certain length of time, the pilot touched me and said: 'We should be there by now.' I said, 'Yeah, I was thinking the same thing.' We got to checking around and we didn't see any big lights in sight or anything. That was almost 40 minutes after the hour, and I thought we should have hit this place about 30 minutes after.

"After that, we decided to look around for some lighted cities. I remember the pilot turned to the right and we didn't see any lighted cities. We turned northeast and saw a city way off and the pilot said: 'Well, we should fly and see what this lighted city is.' I don't remember the exact time it took to get to this lighted city. At the time we were trying radio contact and we couldn't get an answer. I started fiddling with the omni and I noticed we weren't picking up any omni stations or anything."

Question: "What altitude were you?"

Copilot: "I thought we were at 3,500 at the time, but I didn't look at the altimeter. I do remember flying in a northeasterly direction and one time the pilot did go around to the north, flying into this lighted field. He recognized it and I didn't. He said he knew where it was and about that time the omni started picking it up. We were a few miles out then and after we flew over it, he definitely said he knew where he was. The omni was picking it up. He took up a heading he said he knew would take us directly to our destination. After that, I just sort of sat back. After a few minutes, the engine started sputtering. We were on auxiliary at the time, so we switched over to the other tank. Before we did that, the pilot contacted the airfield and extended the flight plan, I thought, 45 minutes.

"I asked, 'Are you sure we got enough to make it on to our destination?' He said, 'Yeah, we still have the full right tank.'

"After we flew on, I looked over and the right tank was reading about one-quarter, so I asked, 'You sure we got enough, or do you think we ought to land?' We got to discussing it and I thought it safer to land, rather than try to go in and pinpoint our destination. . . . I could see where a familiar unlighted airfield was on the right wing tip. After talking awhile, the pilot agreed with me that maybe we'd better get over there and land. So we went on over and flew over, turned the landing lights on, and flew down the strip."

Question: "What was your altitude at this time?"

Copilot: "I thought we were up about a thousand feet—that's the way I estimate it. We flew until we got on a point where we thought he should land, and he turned and flew downwind.

"I just took my eyes from the outside and tied my safety belt and that's the last thing I remember. The pilot seemed to be all right and I thought that he was going to make the landing OK. . . . I didn't know if he had turned final, and it happened quick-

ly. Whatever we struck, evidently my head struck something at the same time, and that's the last thing I remember."

Medical report: "The pilot died several hours after the crash. . . .

"An autopsy and toxicology studies were performed. . . . These revealed death was due to the injuries sustained in the crash, with negative findings for carbon monoxide, and a blood alcohol of 0.112% or .112mg%. One significant item noted by the pathologist was that the patient received approximately 2,000 cc of glucose during his treatment.

"We can definitely say that the pilot's blood alcohol level was above .112mg% at the time of the accident. But, without knowing fluid loss (both sensible and nonsensible), it would be impossible to calculate the effect of dilution by the glucose. However, to give you some idea of his time-of-crash level, we must first note that there was an 8-10 hours time difference between the crash and death, and that an average person will lower his blood alcohol level about .015mg% per hour.

"We cannot expect that the pilot metabolized at this average rate, since he was in shock (which reduces liver profusion) at least part of the time. If metabolism were reduced two-thirds, then this factor alone would raise the level to .190mg% at the time of the accident. Even if the metabolic rate were cut in half, it would put the blood alcohol level at approximately .150mg% (without taking into consideration the dilution of the glucose). . . ."

Flight surgeon: "The pilot and copilot were probably in no condition to adequately pilot this plane on a night cross-country flight. The autopsy findings indicated blood alcohol of 0.112mg% after the deceased pilot had received 2,000 cc of glucose and water. If an average man of his size had 5,000 cc of whole blood diluted with this glucose, it would give the blood alcohol level to be 0.154mg% by weight at the time of the crash. A driver or pilot, uncoordinated at 0.05mg% blood alcohol, is largely intoxicated at 0.10mg%, and is stone drunk at 0.40mg%. Death occurs at around 0.5mg% of blood alcohol.

"The disoriented flight path followed, the lack of fuel precautions taken, and the time taken for a relatively simple cross-country flight makes the contributing cause of the fatal accident pilot error. This was due to alcohol intoxication. . . ."

William H. Barthel
Deputy Director
Directorate of Research,
Development and Engineering
U. S. Army Aviation Materiel Command

U-8 PILOTS- ARE YOU CONFUSED?

RECENTLY, A U-8 PILOT made a precautionary landing after noting smoke coming from the no. 1 engine. Inspection showed that a one-inch hole had burned through the ring lands and down through the skirt of the piston in the no. 2 cylinder. Metal particles were found in the oil screen.

The no. 2 engine of another U-8 aircraft ran rough, emitted smoke, and failed during level-off at

7,000 feet. The piston and rings of the no. 2 cylinder were found fragmented. Other recent U-8 mishap briefs read:

"No. 1 engine ran rough during letdown from 5,000 feet. Propeller was feathered and engine shut down. Caused by rod and cylinder failure of no. 6 cylinder."

"No. 1 engine ran rough. Caused by failure of exhaust valve in no. 6 cylinder. Exhaust valve of no. 5 cylinder of same engine had failed 73 hours previously."

"No. 2 engine misfired and lost power. Engine was shut down and propeller feathered. Caused by failure of no. 5 cylinder. Cylinder was blown off."

"No. 1 engine lost power at completion of climb during IFR flight. Engine was shut down and propeller feathered. Caused by cracks in no. 2 cylinder. Suspect no. 4 cylinder also cracked."

Although the 0-480 engine has proved to be an efficient and reliable powerplant, cylinder failures, including valves, pistons, and connecting rods continue to be prime causes of engine malfunctions. This has led some pilots to use lower settings than those outlined in the operator's manual. Basis for their actions can be found in remarks made by some U-8 pilots during informal discussions.

" . . . It stands to reason that the lower you keep cylinder head temperatures and pressures, the less likely you are to damage the engine. . . . "

" . . . The higher the engine rpm, the greater the friction and heat generated, and the greater the wear. . . . "

" . . . If my aircraft is carrying a light load, density altitude is low, and runway length ample, I don't use a manifold pressure of 48" Hg for takeoff. And I don't climb at METO power unless I need to. Engine problems could be reduced if all pilots followed this policy. . . . "

Other pilots disagree:

". . . The operator's manual states to advance the throttle to a manifold pressure of 48" Hg for takeoff, and that's exactly what I do – for *every* takeoff. . . . "

" . . . As far as engine wear is concerned, it doesn't matter whether you climb at 3200 rpm and a manifold pressure of 45" Hg, or 3000 rpm and 40" Hg. . . . "

The pilot's concern is both justifiable and desirable. He flies the aircraft under varying conditions of weather and visibility over all types of terrain. He is responsible for its safety and that of its occupants. His knowledge and use of correct procedures can do much to enhance engine life and reliability. But how valid are the arguments advanced by some pilots?

The 0-480 engine is a supercharged, six cylinder, air-cooled, opposed type engine, designed to develop 340 brake horsepower at 3400 rpm and a manifold pressure of 48" Hg on a standard day. This is 70 horsepower more than that developed by a similar nonsupercharged engine. To squeeze out this extra power, the additional demands imposed on the engine result in higher cylinder head temperatures, pressures, and loads. Under these conditions, it is imperative that all engine systems function properly. Airflow around cylinders must be unrestricted and of sufficient volume to satisfactorily dissipate heat. Lubrication must be faultless. Ignition timing must be within acceptable limits. Any malfunction in these or other areas can cause either incipient or immediate engine failure.

It would seem, then, that by selecting the lowest possible power settings needed for existing conditions during takeoff and climb, we could reduce cylinder head temperatures and pressures as well as internal stresses, prolonging engine life. In reality, *a properly maintained* engine can safely withstand the loads imposed on it at power settings established by the manufacturer. Nothing is gained by using lower power settings than those stipulated in the operator's manual.

A chain hoist rated at 5 tons will give just as satisfactory service if used to lift 5 ton loads as it will if limited to lesser ones. The safety factor designed into the equipment by the manufacturer ensures this. *It is important, however, not to exceed the specified limitations of the equipment or otherwise damage it, reducing its safety factor.* Lifting loads greater than 5 tons; operating the hoist in such a way as to "bounce" or "bump" loads, even if they are lighter ones; or damaging the chain links will result in overstressing the equipment and reducing its safety factor. In time, the hoist may fail.

Similarly, improperly performed maintenance or failure to correct discrepancies can subject the 0-480 engine to abnormal stresses during operation, causing premature failure. An improperly timed magneto, or a malfunctioning carburetor can result in high cylinder head temperatures and detonation, damaging cylinders, valves, pistons, and connecting rods. But the majority of engine overstresses result from exceeding engine limitations. Overboosting is the most common cause. It can occur either by exceeding power settings stipulated in the operator's manual or by using them without qualification, particularly during takeoff from high field elevations and during climb.

The operator's manual specifies a takeoff power

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Editor-in-Chief
U. S. ARMY AVIATION DIGEST

I call your attention to page 49 of the March issue of the AVIATION DIGEST. You invited readers to see how many mistakes they could find. Upon turning to page 63 I was surprised to see that the second most important piece of equipment that an aviator should wear was not listed as not being worn.

Why even Pearl on page 52 knows that the aviation flight suit should be worn at all times when flying because one of the most flammable objects that the pilot on page 49 is wearing is his nice fresh, STARCH IMPREGNATED uniform.

SP6 J. L. Bridgewater
Co D, 15th TC Battalion
1st Cavalry Division

Dear Specialist Bridgewater:

The most important thing about what aircrewmembers wear, whether flight suits or fatigues, is that the material be inherently fire retardant or treated to make it fire retardant. Despite his other mistakes, the pilot on page 49 of the March issue was wearing fatigues which had been treated by the fire retardant process shown on page 52 of the May issue of the AVIATION DIGEST.

PEARL

Dear Pearl:

I am the safety officer for the 22nd Aviation Detachment in Germany. We have been trying to get Individual Survival Kits, FSN 6545-611-0978, but our medical support tell us we are not authorized them. Could you please tell me the authority for requisitioning them and to whom do we submit the requisitions?

CW2 Benjamin J. Epps, Jr.
22nd Aviation Detachment

Dear Mr. Epps:

TA 8-100, "Allowances of Medical Expendable Supplies," dated 9 December 1964, lists the PSK2 survival kit as a medical item, but it is not a basis of issue. The kit may be purchased with unit funds as a medical item.

CTA 50-901 (Oct 66) authorizes the SEEK-1 kit (FSN 4240-731-9909) for aircrewmembers. If you can not get this through normal supply channels, I recommend your commander take the matter up through command channels.

In the June issue of the ARMY AVIATION DIGEST, I demonstrated the usefulness of a new survival kit which has been developed by Army personnel specifically for U. S. Army aviation requirements. USABAAR has recommended that the new survival kit be classified Standard A, replacing the SEEK-1 kit, for issue to each Army aircrewmember. Action on this is pending.

PEARL

Dear Pearl:

I am currently serving in the Army at Fort Devens and am flying with the Fort Devens Flying Club. I just had a flight physical by Fort Devens flight surgeon and during the course of the examination he stressed safety in the clothes I should wear and have on hand whenever I'm flying. I would like to obtain some gloves and an Army flight jacket, possibly more equipment, but I don't know where I can get this equipment. Can you be of any assistance to me? I wonder if there is a place where the Army might have new and/or used equipment that is available to its active service members. Could you please send me any information you might have to offer on places and prices of such equipment.

SP4 Jay A. Lown
Fort Devens, Mass.

Dear Specialist Lown:

Your flight surgeon is right! Proper flight gear is very essential to maintain protection for aviators.

If you are a crewmember on flying status, you are authorized to draw a helmet, gloves, and flying jacket through supply.

However, if you are not a crewmember, you may wear your GI boots for protection. Any type of leather glove is far better than no protection at all, even your GI gloves. Unless the aircraft you are flying is properly equipped, a flying helmet will not be compatible with the radios in the aircraft.

Hope this may be of some help.

PEARL

U-8 PILOTS — CONFUSED?

Continued from page 61

setting of 3400 rpm and a manifold pressure of 48″ Hg *at sea level.* Similarly, it authorizes a manifold pressure of 45″ Hg at 3200 rpm for climb *at sea level.* In each instance, however, manifold pressure must be reduced approximately 1/3″ Hg for every thousand feet of altitude. Furthermore, continuous use of takeoff power is limited to five minutes. Failure to observe these procedures results in overboosting the engine even though a manifold pressure of 48″ Hg is not exceeded. It's easy to see why.

Before the engines of a U-8 aircraft are started, the manifold pressure gauge indication at a field elevation of 3,000 feet will be approximately 29″ Hg. This is approximately one inch *less* than that at sea level. A manifold pressure setting of 48″ Hg indicated at 3,000 feet, then, is equivalent to a comparable setting of 49″ Hg at sea level.

How significant is this? The Organizational Maintenance Manual (TM 55-1510-201-20) gives the answer: " . . . Overboost of *any* magnitude for periods in excess of *15 seconds* requires *removal* of the engine. . . . " How often is this limitation exceeded *without the pilot's realizing it?* When this happens, not only is the engine *not* removed, it is not even inspected.

But overboosting is not the only way a pilot can inadvertently damage an engine. Rapid acceleration and deceleration can impose excessive loads on engine components and cause failures. Since the supercharger impeller is geared to the engine crankshaft at an 11.27 : 1 gear ratio, sudden acceleration of the engine from idle to 3400 rpm, a gain of 2700 rpm, results in an increase in impeller speed of over 30,000 rpm. Although the manufacturer has linked the supercharger impeller to the crankshaft by means of springs to absorb torsional loads normally encountered, damage to the impeller gear train can occur when throttle movement is abrupt.

In addition, rapid operation of the throttles at high engine rpm and high manifold pressure; or operating the engines under conditions of *high* engine rpm (2800 rpm or higher) and *low* manifold pressure (under 15″ Hg) may unbalance or detune the crankshaft vibration dampeners with results similar to these:

"No. 1 engine vibrated and oil pressure dropped rapidly during final approach for landing. Mixture was pulled, propeller feathered, and approach continued. Caused by crankshaft counterweight breaking loose from shaft. Counterweight went through top of crankcase and broke cam shaft."

"No. 2 engine failed during flight. Suspect loss of counterweight from engine crankshaft."

During flight, propeller levers should not be advanced to the full low pitch position at an airspeed above 100 knots indicated.

Overspeeding of the engine is another cause of engine problems. One result is bending of piston rods which may fail at a later time. In summation, engine life and reliability begins with correct maintenance. The pilot's support in this area is a necessity. He should closely monitor engine instruments during flight and report any abnormalities. It is important for him to note both the amount any engine limitation has been exceeded as well as the length of time. *Requirements for replacing engines and thoroughness of inspections are based on this information.*

The pilot should make thorough engine operational checks before each flight and be skeptical of any marginal performance. Recently, one pilot noted backfiring and loss of power of the no. 2 engine shortly after takeoff. He feathered the propeller, shut down the engine, and returned to the airfield. During the rollout, the *good* engine failed. The pilot reported that the right magneto drop on the no. 2 engine had been *slightly* excessive, and that after starting, oil pressure build-up to the no. *1* engine had been slow.

Power settings should be made in accordance with the U-8 operator's manual (TM 55-1510-201-10) as follows: For takeoff, use full rated power of 48″ manifold pressure (MP) and 3400 rpm *at sea level.* Reduce manifold pressure 1/3″ for each 1,000 feet of altitude above sea level.

For initial climb, use 45″ manifold pressure and 3200 rpm (METO power) *at sea level.* Manifold pressure must be reduced 1/3″ for each 1,000 feet of altitude above sea level.

If the aircraft is climbed at 40 inches manifold pressure and 3000 rpm (all levels to critical altitude), it is recommended that the aircraft be flown at a higher airspeed than best rate of climb speed to ensure best engine cooling. Care must be taken to keep the manifold pressure at 40″ as the carburetor or fuel injector drifts lean at about 37″ and can cause high cylinder head temperatures. Power enrichment switches on the U-8F aircraft can be used to reduce cylinder head temperatures during climb and cruise flight.

But remember, there are no known maintenance or operational problems that indicate 40″ and 3000 rpm is better or worse than 45″ and 3200 rpm for climb power *at sea level.* In fact, analysis indicates that *the best rate of climb* with *best engine cooling* is obtained at METO power.

AAFSS ROLLOUT

ARMY AVIATION is one step closer to having a helicopter developed specifically as an aerial weapon system. The first advanced aerial fire support system (AAFSS) is now undergoing a series of system tests leading to its first flight, scheduled for later this year.

Designated numerically as the AH-56A, the aircraft's official name is "Cheyenne," in keeping with the Army's use of Indian names for its aircraft. The AH-56A is a high speed compound helicopter (see "Helicopter Crystal Ball," DIGEST, Aug 66) with a forward thrust propeller. It will carry a variety of weapons that will enable it to place accurate, discriminating fire on specific targets.

The Cheyenne is designed to escort troop-carrying helicopters in airmobile operations and to provide direct fire support in combat landing zones. It is capable of carrying the wire-guided antitank TOW missile, the XM-129 40 mm grenade launcher, the XM-140 30 mm gun, and the XM-159 or XM-157 2.75" folding fin aerial rocket. The XM-159 is a 19 round, reusable single fire aluminum tube launcher and the XM-157 is a 7 round rocket pod.

A crew of two mans the aircraft (pilot and copilot/gunner). They sit one behind the other with the gunner forward and the pilot to the rear. Both may control the aircraft. They are protected from ground fire by armorplate.

Aided by a computer, the gunner sits on a full-circle swiveling seat which enables him to search and track targets and to fire upon them without requiring the pilot to veer from his course.

The pilot can also fire the weapons. He is equipped with a helmet sight that permits him to automatically point the guns wherever he looks.

Maximum speed (sea level) of the Cheyenne is 220 knots. Its maximum cruising speed is 210 knots, which is faster than any other helicopter now in the Army inventory. In comparison, the cruising speed of the UH-1D is 100 knots and that of the CH-47A is 130 knots.

The aircraft is designed for a quick turn-around. Returning from a combat flight it can be readied and armed for a new mission in 10 minutes. It will climb at the rate of 3,420 feet a minute and make a complete turn in a radius far less than that of present-day helicopters.

It is powered by a General Electric T64-16 gas turbine engine with 3,435 shaft horsepower. The aircraft is 55 feet long and has a gross weight of 16,995 pounds.

The AH-56A employs the rigid-rotor system in which the rotor blades are fixed rigidly to the mast. Its main rotor blades have a diameter of 50 feet and are made of stainless steel.

In addition to the rotor blades, the Cheyenne has a pusher propeller which is used for auxiliary propulsion when the main blades are unloaded in high speed flight. The thrusting propeller is powered by a shaft from the main engine. It can also be reversed in flight for braking.

The aircraft also has a short 27-foot wing which provides most of the lift when the aircraft is flown at high speeds.

For comfort of the crew, a special cooling and heating system has been designed for the Cheyenne. It consists of a lightweight air cycle machine, heat exchanger, water separator, and pneumatic flow and temperature controls.

The Army has ordered 10 prototypes of the AH-56A.

THE ARMY'S AH-56A makes its first public appearance at the Van Nuys plant of the Lockheed-California Company. It will be nearly twice as fast as current combat helicopters in Vietnam. The combat version of the vertical takeoff and landing AH-56A will escort troop-carrying helicopters and direct fire support missions. The heavily armed but agile aircraft — called a compound because it has fixed wings and helicopter rotor blades along with a gas turbine engine — will be able to dash suddenly from its convoy to fire on surprise targets and then return to its escort position. Seated in the AH-56A are Lockheed engineering test pilots Herman Salmon and Don Segner (front), who are scheduled to make the initial flights later this year.